Texas GulfLink, LLC
Texas GulfLink Project

PSD Permit Application for Deepwater Port Facility

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1.0 INTRODUCTION

Texas GulfLink, LLC plans to develop the Texas GulfLink Deepwater Crude Export Terminal project ("Project"), a proposed deepwater crude oil export terminal, located near Freeport, Texas, in Brazoria County. The Project will provide critical infrastructure to the Houston market to clear over supplied crude oil volumes from West Texas and the Midcontinent. As United States crude oil exports continue to increase, critical infrastructure along the Gulf Coast will be necessary to provide an efficient and safe solution for large-scale exporting to international markets. The completed facility will be capable of fully loading Very Large Crude Carrier (VLCC) vessels for the purpose of exporting crude oil to international markets.

1.1 Project Description

The Texas GulfLink Terminal Project will construct a Deepwater Oil Port near Freeport, Texas, capable of loading deep draft VLCC vessels. The Deepwater Port will deliver crude oil via an onshore crude pipeline to above-ground crude oil storage tanks. Upon nomination from the crude oil shipper, the oil will be transported to one of two floating Single Point Mooring (SPM) buoys in the Gulf of Mexico, approximately 32.5 nautical miles (45 miles) offshore, via a 42-inch pipeline. The SPM buoys will allow for VLCC vessels to moor and receive up to 2 million barrels of crude oil each to be transported internationally. A manned offshore platform, equipped with round-the-clock port monitoring, custody transfer metering, and surge relief will provide assurance that shippers' commercial risks are mitigated and that the port is protected from security threats and environmental risks.

The Deepwater Port *offshore* facility will consist of the following assets:

- One 42-inch outside diameter, 32.5 nautical mile long crude oil pipeline will be constructed from the shoreline crossing in Brazoria County, Texas, to the Texas GulfLink Deepwater Port, for crude oil delivery. The pipeline, in conjunction with 12.3 statute miles of new-build 42-in onshore pipeline, will connect the onshore crude oil storage facility and pumping station (Jones Creek Crude Storage Terminal) to the offshore Texas GulfLink Deepwater Port. The crude oil will be metered departing the onshore terminal as it leaves the tank and again at the offshore platform, providing custody transfer and line surveillance.
- One fixed offshore platform structure, with 4 piles, located in the Galveston Outer Continental Shelf lease block 423, approximately 32.5 nautical miles off the coast of Brazoria County, Texas, in a water depth of approximately 105 feet. The fixed platform will be constructed with three decks, including generators, pig receivers, lease automatic custody transfer (LACT) unit, oil displacement prover loop, living quarters, electrical and instrumentation building, portal cranes, helideck, and a vessel traffic control room utilizing a state-of-the-art radar system.

- The Deepwater Port will utilize two (2) Single Point Moring (SPM) buoys, each having:
  - Two (2) 24-inch inside diameter crude oil subsea hoses interconnecting with the crude oil pipeline end manifold (PLEM)
  - Two (2) 24-inch inside diameter floating crude oil hoses connecting the moored VLCC or other crude oil carrier for loading to the SPM buoy – The floating hoses will be approximately 1,100 feet in length and rated for 285 psig. Each floating hose will contain an additional 200 feet of 16-inch "rail tail hose" designed to be lifted and robust enough for hanging over the edge railing of the VLCC or other crude oil carrier. The subsea hoses will be approximately 160 feet in length and rated for 285 psig.
- Two (2) PLEMs will provide the interconnection between the pipelines and the SPM buoys. Each SPM buoy will have one (1) PLEM for crude oil export. Each crude oil loading PLEM will be supplied with crude oil by one (1) 42-inch outside diameter pipeline, each approximately 1.25 nautical miles in length.

The Deepwater Port *onshore* project components will consist of the following:

- New installed 9.45 miles of 36" pipeline from the Department of Energy (DOE) facility at Bryan Mound to the Texas GulfLink Jones Creek Crude Storage Terminal.
- The proposed Jones Creek Crude Storage Terminal located in Brazoria County, Texas, on approximately 200 acres of land consisting of twelve (12) above-ground domed external floating roof (DEFR) storage tanks, with a site-wide maximum storage capacity of approximately 8.5 million barrels of "sweet" crude oil.
- The Jones Creek Terminal will also include:
  - Six (6) electric-driven mainline crude oil pumps
  - Three (3) electric driven booster crude oil pumps
  - One (1) crude oil pipeline pig launcher
  - One (1) crude oil pipeline pig receiver
  - Two (2) measurement skids for measuring crude oil – one (1) skid located at the incoming pipeline from the Bryan Mound facility and one (1) skid installed for the outgoing crude oil barrels leaving the tank storage to be loaded on the VLCC
  - Ancillary facilities, to include an operations control center, electrical substation, offices, and warehouse building.

1.2 Purpose

Pursuant to Title 40 of the Code of Federal Regulations, Part 52, Section 52.21 (40 CFR 52.21), Texas GulfLink, LLC respectfully submits this Prevention of Significant Deterioration (PSD) permit application to authorize air pollutant emissions from the proposed offshore Deepwater Port, which is part of the Texas GulfLink Project. Pollutant emissions generated will include carbon monoxide (CO), nitrogen oxides (NOx), particulate matter with mean aerodynamic diameters less than or equal to 10 microns/2.5 microns (PM_{10}/$PM_{2.5}$), sulfur dioxide (SO_2), greenhouse gases

(GHG), expressed as carbon dioxide equivalent (CO_2e), and volatile organic compounds (VOC) with speciated Hazardous Air Pollutants (HAPs), such as benzene. Total facility-wide emission rates are summarized in Tables 3-1 and 3-2 of Section 3.0 of this application.

This permit application contains information sufficient to demonstrate compliance with applicable requirements outlined in 40 CFR 52.21. This information includes a description of the Deepwater Port facility, including the two SPMs, emission rate calculation (methods and calculation spreadsheets), a federal (top-down) Best Available Control Technology (BACT) an off-property impacts analysis, and federal air regulations applicability review.

1.3 Area Map

Figure 1 in Appendix A is an area map showing the proposed Texas GulfLink Deepwater Port facility to be located approximately 28.3 nautical miles offshore the coast of Brazoria County, Texas. As shown in the map, the proposed facility will consist of the fixed platform and two Single Point Mooring (SPM) buoys for loading the VLCCs.

2.0 PROCESS DESCRIPTION

As described in detail in Section 1.1 of this application, the proposed Texas GulfLink Deepwater Port facility will consist of a permanently manned offshore platform with two associated single point mooring (SPM) buoys for the loading of Very Large Crude Carriers (VLCCs). Sweet crude oil, with a maximum Reid Vapor Pressure (RVP) of 10 psi, will be pumped via pipeline from the onshore Jones Creek Crude Storage Terminal to the Deepwater Port facility to be loaded into the VLCC vessels. Air pollutant emissions from Deepwater Port facility operation will result from the following emission sources (Emission Point Number, EPN, given):

- VOC emissions from marine loading of crude oil into VLCC vessels [EPN (P) M-1]
- Combustion emissions from 2 diesel electric generator engines [EPNs (P) G-1 and (P) G-2]
- Combustion emissions from 1 diesel portal crane engine [EPN (P) C-1]
- VOC emissions from 1 fixed roof tank storing diesel fuel [EPN (P) DT-1]
- VOC emissions from 4 “belly” tanks (i.e., diesel fuel tanks for electric generators, FWP, and crane engines) [(P) BT-1, BT-2, BT-3, and BT-4]
- VOC emissions from 1 fixed roof crude oil surge tank [EPN (P) T-1]
- Combustion emissions from 1 diesel emergency firewater pump engine [EPN (P) FWP-1]
- VOC emissions from pipeline pigging operations [EPN (P) P-1]
- Fugitive VOC emissions from platform piping components [EPN (P) F-1]
- Fugitive VOC emissions from piping components on 2 SPM loading buoys [EPN (P) F-2]
- VOC emissions from crude oil sampling activities [EPN (P) S-1]
- VOC emissions from pump maintenance [EPN (P) PM-1]

A summary of each EPN, its description, and expected pollutants is presented in Table 2-1.

Table 2-1: Summary of Emission Sources at Deepwater Port Facility

EPN *	Description	Pollutant
(P) M-1	Marine loading into VLCCs	VOC **
(P) G-1	Diesel-fired electric generator engine	Combustion ***
(P) G-2	Diesel-fired electric generator engine	Combustion
(P) C-1	Diesel-fired portal crane engine	Combustion
(P) DT-1	Day tank storing diesel fuel (fixed roof)	VOC
(P) BT-1	Belly Tank 1	VOC
(P) BT-2	Belly Tank 2	VOC
(P) BT-3	Belly Tank 3	VOC
(P) BT-4	Belly Tank 4	VOC
(P) T-1	Crude oil surge tank (fixed roof)	VOC
(P) FWP-1	Diesel-fired emergency firewater pump engine (*MSS activity*)	Combustion
(P) P-1	Pipeline pigging operations (*MSS activity*)	VOC
(P) F-1	Fugitives from platform piping component leaks	VOC

EPN *	Description	Pollutant
(P) F-2	Fugitives from SPMs piping component leaks	VOC
(P) S-1	Crude oil sampling activities	VOC
(P) PM-1	Routine pump maintenance (*MSS activity*)	VOC
(P) MSS-1	Painting/Abrasive Blasting (*MSS activity*)	VOC, PM_{10}/$PM_{2.5}$

* (P) stands for Platform

** VOC emissions include speciated hazardous air pollutants (HAPs), such as benzene

*** Combustion pollutants are NOx, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, GHG (CO_2e), and un-combusted VOC

A simplified process flow diagram illustrating the offshore Deepwater Port's process is provided as Figure 2 and included in Appendix A of this application.

3.0 EMISSION RATE CALCULATION METHODS

In this section, the emissions rate calculation methods used to estimate maximum pollutant emissions from the proposed Deepwater Port Facility operations are described. Operation of the offshore facility will result primarily in emissions of volatile organic compounds (VOC). Lesser amounts will be emitted of nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), hydrogen sulfide (H_2S), particulate matter (PM), including PM with an aerodynamic diameter of 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$), and hazardous air pollutants (HAPs), including benzene. Greenhouse gas (GHG) emissions, expressed as carbon dioxide equivalent (CO_2e), were also addressed. Maximum hourly (lb/hr) and annual average (tons/yr) emission rates were estimated for each source of emissions. The emissions are on a Potential-to-Emit (PTE) basis. A summary of the site-wide total annual PTE rates for criteria and GHG pollutants is given in Table 3-1 below. A summary of site-wide total annual H_2S and HAP emission rates is given in Table 3-2 below. Detailed emission rate calculations are provided in Appendix B of this application.

Note that only those offshore pollutant emissions associated with the Deepwater Port Facility that can be permitted are addressed in this PSD permit application. Other offshore emissions associated with the Texas GulfLink Project, including those from construction and “indirect” sources (e.g. tug/pilot boats, other vessels, etc.), are not included in this permit application, but are addressed in the Emission Impacts Analysis section of the deepwater port license application.

3.1 Emissions Summary

Table 3-1 summarizes the site-wide total annual PTE emission rates of the criteria and greenhouse gas (CO_2e) pollutants for the proposed Deepwater Port Facility.

Table 3-1: Summary of Criteria and GHG PTE Rates for Deepwater Port Facility

EPN	Source	CO_2e		PM_{10}		$PM_{2.5}$		SO_2		NOx		CO		Total VOC	
		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
(P) M-1	Marine Loading													4,709.72	9,679.15
(P) G-1	Generator 1	4,856	4,406	0.32	1.39	0.32	1.39	0.01	0.05	9.92	43.45	5.57	24.40	0.27	1.16
(P) G-2	Generator 2	4,856	4,406	0.32	1.39	0.32	1.39	0.01	0.05	9.92	43.45	5.57	24.40	0.27	1.16
(P) C-1	Crane 1	485	2,132	0.14	0.61	0.14	0.61	0.01	0.02	2.59	11.32	2.45	10.71	0.21	0.92
(P) DT-1	Day Tank 1													0.001	0.01
(P) BT-1	Belly Tank 1													0.0002	0.001
(P) BT-2	Belly Tank 2													0.0002	0.001
(P) BT-3	Belly Tank 3													0.0002	0.001
(P) BT-4	Belly Tank 4													0.00002	0.0001
(P) T-1	Surge Tank													0.40	1.74
(P) FWP-1	MSS - Firewater Pump	5	20	0.12	0.01	0.12	0.01			2.12	0.11	2.01	0.10	0.18	0.01
(P) P-1	MSS - Pigging Operations													83.76	0.50
(P) F-1	Platform Fugitive Emissions													0.03	0.12
(P) F-2	SPM System Fugitives													0.10	0.44
(P) S-1	Sampling Activities													0.10	0.05
(P) PM-1	MSS - Pump Maintenance													4.00	0.002
(P) MSS-1	MSS - Abrasive Blasting / Painting			0.01	0.06	0.002	0.01							0.06	0.26
	TOTAL EMISSIONS (TPY)	**10,201**	**10,965**	**0.91**	**3.47**	**0.89**	**3.42**	**0.03**	**0.13**	**24.54**	**98.33**	**15.60**	**59.60**	**4,799.10**	**9,685.53**

As shown in Table 3-1, the total site-wide VOC emission rate is greater than the PSD major source emissions threshold of 250 ton/yr. As described in more detail in Section 4.0 of this application, because emissions of VOC trigger PSD for the facility, the other pollutants' emission increases are compared to their respective PSD *significance* emission thresholds. The PSD significance threshold for NOx is 40 tpy; therefore, as shown in the table, PSD is triggered for NOx as well. The other pollutants have increases below their respective PSD significance emission thresholds; thus, the facility is considered minor with respect to PSD for these pollutants.

Table 3-2: Summary of H_2S and HAP PTE Rates for Deepwater Port Facility

EPN	Source	H_2S		Acetaldehyde		Benzene		Isopropylbenzene		Ethylbenzene		Formaldehyde		Hexane (-n)		2,2,4-Trimethylpentane (isooctane)		Toluene		Xylene (-m)	
		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
(P) M-1	Marine Loading	0.12	0.05			20.78	42.70	0.16	0.33	1.39	2.86			107.53	220.99	1.79	3.67	10.17	20.90	4.08	8.38
(P) G-1	Generator 1			0.0002	0.001	0.01	0.02					0.001	0.002					0.002	0.01	0.002	0.01
(P) G-2	Generator 2			0.0002	0.001	0.01	0.02					0.001	0.002					0.002	0.01	0.002	0.01
(P) C-1	Crane 1											0.004	0.02								
(P) DT-1	Day Tank 1																				
(P) BT-1	Belly Tank 1																				
(P) BT-2	Belly Tank 2																				
(P) BT-3	Belly Tank 3																				
(P) BT-4	Belly Tank 4																				
(P) T-1	Surge Tank					0.002	0.01			0.0001	0.001			0.01	0.04			0.001	0.004	0.0003	0.002
(P) FWP-1	MSS - Firewater Pump																				
(P) P-1	MSS - Pigging Operations					0.37	0.002							1.91	0.01			0.18	0.001		
(P) F-1	Platform Fugitive Emissions						0.0007062							0.0005	0.002				0.001177	0.0004	0.002
(P) F-2	SPM System Fugitives																				
(P) S-1	Sampling Activities																				
(P) PM-1	MSS - Pump Maintenance																				
(P) MSS-1	MSS - Abrasive Blasting / Painting																				
TOTAL EMISSIONS (TPY)		**0.12**	**0.05**	**0.0003**	**0.001**	**21.16**	**42.75**	**0.16**	**0.33**	**1.39**	**2.86**	**0.005**	**0.02**	**109.45**	**221.04**	**1.79**	**3.67**	**10.36**	**20.92**	**4.08**	**8.39**

The major source definition that would make a facility major for HAPs is 10 tons/yr of a single HAP or 25 tons/yr of an aggregate of all HAPs. As shown in Table 3-2, there are individual HAPs that will have emission rates greater than 10 tons/yr (i.e., benzene, n-hexane, and toluene). Additionally, the aggregate total emissions from all HAPs is greater than 25 tons/yr. Therefore, the Deepwater Port Facility is considered major with respect to HAPs. As described in Section 6.0 of this application, the applicability of federal air quality rules was determined based upon the Deepwater Port Facility being considered major for HAPs. The following sections describe the calculation methods used to estimate pollutant emissions from the various emission units at the Deepwater Port Facility.

3.2 Marine Loading [EPN (P) M-1]

Crude oil will be loaded into VLCCs at the Deepwater Port at a proposed annual rate of 365 million barrels per year (bbl/yr). The maximum hourly rate (lb/hr) for crude loading will be 85,000 bbl/hr. VOC emissions from loading were estimated using EPA emission factors from AP-42, Chapter 5, Section 5.2. Equation 2 in this section was developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges.

Based upon expected crude oil slates, a Reid Vapor Pressure (RVP) of 10 psi was assumed for the marine loading emission rate calculations. The maximum and average H_2S concentrations in the sweet crude were assumed to be 25 parts per million by volume (ppm_v) and 5 ppm_v, respectively.

The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program and then modified for site-specific assays to include n-hexane as a speciated HAP.

3.3 Diesel-Fired Electric Generator Engines [EPNs (P) G-1 and (P) G-2]

Two 650 KW electric generators will be used to supply electricity to the platform. Maximum emission rates for the combustion pollutants of NOx, CO, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 89.112(a) Table 1, as referenced by 40 CFR 60, NSPS IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.4 (for "large" stationary diesel-fired generators), Table 3.4-1. The SO_2 factor was obtained by multiplying the factor in the table (0.00809 lb/hp-hr) with S_1, which is the sulfur content in the fuel, in this case 15 ppm_v (0.0015%). Finally, the emission factors for GHG were obtained from 40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel).

3.4 Diesel-Fired Portal Crane Engine [EPNs (P) C-1]

A 425 hp (317 KW) portal crane will be used on the platform. Maximum emission rates for the combustion pollutants of NOx, CO, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 89.112(a) Table 1, as referenced by 40 CFR 60, NSPS IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.4 (for "large" stationary diesel-fired generators), Table 3.4-1. The SO_2 factor was obtained by multiplying the factor in the table (0.00809 lb/hp-hr) with S_1, which is the sulfur content in the fuel, in this case 15 ppm_v (0.0015%). Finally, the emission factors for GHG were obtained from 40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel).

3.5 Day Tank Storing Diesel Fuel [EPN (P) DT-1]

The Deepwater Port will include a fixed-roof tank used to store diesel fuel, with a storage capacity of 20,000 gallons. VOC emissions were calculated using U.S. EPA's TANKS 4.09d program. The throughput is proposed to be 300,000 gallons per year. The HAP speciation profile was obtained from the default speciation for diesel in the TANKS 4.09d program.

3.6 Belly Tanks Storing Diesel Fuel [EPNs (P) BT-1, BT-2, BT-3, BT-4]

VOC emissions were estimated from 4 "belly" tanks (i.e., tank is part of the equipment and not stand-alone) storing diesel fuel. These tanks are associated with the 2 electric generators, the portal crane, and the firewater pump. The belly tanks associated with the electric generators and portal crane are expected to have a maximum diesel throughput of approximately 100,000 gal/year. Because the firewater pump is emergency use only, the diesel fuel throughput for it was assumed much less, approximately 1,000 gal/year. The EPA's TANKS 4.09d program was used to estimate VOC emissions from all 4 tanks. The HAP speciation profile was obtained from the default speciation for diesel in the TANKS 4.09d program.

3.7 Crude Oil Surge Tank [EPN (P) T-1]

The proposed Deepwater Port will include one fixed roof tank used as a surge tank, with a storage capacity of 84,000 gallons. VOC emissions were calculated using U.S. EPA's TANKS 4.09d program. Based upon expected crude slates, a Reid Vapor Pressure (RVP) of 10 psi was assumed for the surge tank emission calculation. The throughput is proposed to be 84,000 gallons per year. The average H_2S concentration in the sweet crude was assumed to be 5 ppm_v. The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program and then modified for site-specific assays to include n-hexane as a speciated HAP.

3.8 Firewater Pump Engine [EPN (P) FWP-1]

The emergency-use firewater pump (FWP) engine will be started periodically to ensure its proper operation. Maximum emission rates for the combustion pollutants of NOx, CO, $PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 60, Subpart IIII, Table 4 [225<=kW<450 (300<=Hp<600)]. The PM factor in this table was used for both PM_{10} and $PM_{2.5}$. The NMHC + NOx factor in the table was used for VOC and NOx by assuming 92% NOx and 8% VOC, based on the ratio of the NOx to VOC AP-42 emission factors. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.4 (for "large" stationary diesel-fired generators), Table 3.4-1. The SO_2 factor was obtained by multiplying the factor in the table (0.00809 lb/hp-hr) with S_1, which is the sulfur content in the fuel, in this case 15 ppm_v (0.0015%). Finally, the emission factors for GHG were obtained from 40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel). The engine will be operated as part of reliability testing for no more than 100 hours per year. This reliability testing is considered a Maintenance, Startup, and Shutdown (MSS) activity.

3.9 Pipeline Pigging Operations [EPN (P) P-1]

VOC emissions will result from pipeline pigging operations at the offshore Deepwater Port. Emissions were estimated for pig launching and receiving using the worst-case operation as the emissions basis for the application. The volume (actual cubic feet) of each pig launcher and receiver was calculated based on the inside diameter and length. Because the receiver is at pressure (≤ 1 psig) before it is opened, the volume of gas inside (assumed to be entirely emitted to atmosphere) is corrected to standard volume (standard cubic feet).

VOC emissions were calculated by, first, dividing the standard volume (scf) of the chamber vapor to the molal volume of an ideal gas (385.3 scf/lb-mol) to obtain the lb-mol of emitted vapor when the chamber is opened to the atmosphere. Then, to obtain the mass rate, the vapor molecular weight of crude oil (50 lb/lb-mol) was multiplied to the lb-mol of emitted vapor. This calculation results in a mass rate per receiving event (lb/event). To obtain a maximum hourly rate (lb/hr) and annual average rate (tpy), it was assumed that a single pigging event will last for a half hour, and that the maximum number of pigging events per year will be 12 events.

3.10 Platform Fugitive Emissions [EPN (P) F-1]

Fugitive VOC emissions will result from assumed small emission leaks from piping components such as valves, connectors (flanges), and pump seals. Emission factors from TCEQ's guidance document, *Air Permit Technical Guidance for Chemical Sources – Fugitive Guidance* (APDG 6422, June 2018), were used to estimate VOC emissions. Specifically, the "Petroleum Marketing Terminal" (PMT) factors from Table II of the document were used, which factors assume a 28 PET leak detection and repair (LDAR) program will be implemented. The PMT emission factors were chosen based on the TCEQ's memo dated 12/5/2005 allowing these factors for equipment components in pipeline breakout stations for crude oil and fuel service (gasoline, diesel, and jet fuel). The proposed Texas GulfLink *onshore* tank terminal is a pipeline breakout station, and the crude oil from that facility is transferred directly to the offshore platform for loading into ships. So, the crude oil in the offshore platform piping is, by extension, oil from a crude pipeline breakout station.

The 28PET leak detection and repair (LDAR) program is specific to petroleum marketing terminals and involves an audio, visual, and olfactory (AVO) inspection of the above-ground pipeline system. An emissions control credit is included in the emission factors, so no other control credits were applied.

For the calculations, based on vapor pressure, crude oil is assumed to be a "Light Liquid". The total VOC emission rate was obtained by multiplying the count of a particular component (e.g. valve) by the component's emission factor in Light Liquid service, then summing the emissions from all components. The average H_2S concentration in the sweet crude was assumed to be 5 ppm_v. The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program and then modified for site-specific assays to include n-hexane as a speciated HAP.

3.11 SPM System Fugitive Emissions [EPN (P) F-2]

Valves and flanges associated with the 2 Single Point Mooring (SPM) buoys are assumed to emit VOC. To estimate these emissions, emission factors were obtained from *Table 4, Average Emission Factors – Petroleum Industry (Oil & Gas Production Operations) of TCEQ's Addendum to RG-360A, Emission Factors for Equipment Leak Fugitives Components*, January 2008. Specifically, the factors for Oil and Gas Production Operations, for Light Oil > 20^{o} API were used because none of the emission factor source categories (i.e., for SOCMI, Oil and Gas Production, Refinery, or Petroleum Marketing Terminal) reasonably apply to an SPM system. The worst-case (highest) factors for the valves and flanges making up the two SPM systems were chosen, which were the Oil and Gas Production Operation factors for Light Oil > 20^{o} API. Note that use of these factors does not require a monthly AVO; therefore, Texas GulfLink does not plan on conducting an AVO inspection of the two SPMs. Light liquid emission factors were used, and emissions were conservatively estimated to be 100% VOC.

3.12 Crude Sampling Activities [EPN (P) S-1]

Crude oil assay quality testing will occur at the offshore platform. The crude oil will be sampled, and its physical and chemical properties will be determined for quality assurance. Very small VOC emissions will occur as a result of this sampling activity. To estimate VOC emissions, it was assumed that 1 sample would be taken each work shift, with 3 shifts per day. A VOC emission of 0.1 lb/sample was assumed.

3.13 Routine Pump Maintenance [EPN (P) PM-1]

The 4 proposed electric-driven crude oil pumps at the offshore platform will need periodic maintenance. Very small amounts of VOC emissions will result from opening and draining the pumps. The emissions were estimated assuming 1 lb of VOC will be emitted per maintenance event, and that there will be one maintenance event for each of the four pumps per year.

3.14 Abrasive Blasting / Painting [EPN (P) MSS-1]

The proposed offshore platform coatings will have a designed life of 20+ years. Sandblasting and recoating of the platform structure should not be required within this period, other than spot maintenance where coatings may be damaged by contact with metal objects such as hammers, wrenches, or scaffolding. However, to comply with NEPA requirements, potential maximum hourly (lb/hr) and annual average (tons/yr) emission rates were estimated for PM emissions from abrasive blasting and VOC emissions from painting.

For PM_{10}/$PM_{2.5}$ emissions from abrasive blasting, an application rate of 2,000 lb/hr was assumed. Per industry expertise and best management practices, it was assumed that sandblasting would occur for 8 hours per day and a cumulative total 5 days per year (i.e., a total of 40 hours per year). An uncontrolled PM_{10} emission factor of 0.0014 lb/lb usage was assumed based on the TCEQ's Abrasive Blast Cleaning technical guidance document (RG-169, March 2001). This factor assumes silica sand is used as the blasting media and the factor is higher (more conservative) than the PM_{10} factor of 0.00034 lb/lb usage assuming coal slag is used as the blasting media. Finally, based on this TCEQ guidance, the $PM_{2.5}$ emissions factor is assumed to be equal to 15% of the PM_{10} emissions factor.

Potential VOC and PM emissions were estimated from miscellaneous painting activities. VOC emissions were estimated for the manual application of paint for touch-ups and the use of aerosol cans containing spray paints, primers, degreasers, cleaners and other solvents, and rust inhibitors. VOC and PM emissions were estimated for the spray painting of fixed structures (e.g. tanks). Conservatively, 100% of the VOC content (lb VOC/gal) of all painting materials was assumed to evaporate to the atmosphere. PM emissions from spray painting were estimated using assumed $PM_{10/2.5}$ content, transfer efficiency, and droplet factors for overspray. The detailed painting calculations are shown in Appendix B of this PSD application.

4.0 PSD APPLICABILITY ANALYSIS

This section describes the applicability of the Prevention of Significant Deterioration (PSD) permitting program under 40 CFR 52.21 to the proposed Texas GulfLink offshore Deepwater Port Facility. The offshore facility will be located in federal waters on the Outer Continental Shelf (OCS), at a distance greater than 9 nautical miles, but less than 200 nautical miles, from the Texas coast. Because the facility will not be located in a designated nonattainment area, the Nonattainment New Source Review (NNSR) permitting program does not apply. Additionally, because the offshore facility will be located outside of Texas' seaward boundary (i.e., greater than 9 nautical miles off the coast), the US EPA is the governing permit authority.

As described in Section 2.0 of this application, the offshore facility will consist of a fixed platform and two Single Port Mooring (SPM) buoys that will be used to load crude oil onto Very Large Crude Carriers (VLCCs). As shown in Table 3-1 of this application, VOC will be emitted at the Deepwater Port Facility greater than the major source emissions threshold of 250 tpy, as defined in §52.21(b)(1)(i)(*a*). Therefore, the PSD permitting program is triggered for VOC. Under the PSD rules, if one PSD-regulated pollutant makes the stationary source major for PSD, then one must review the other regulated pollutants' emission increases against their respective PSD *significance* thresholds, given in §52.21(b)(23(i). The PSD significance threshold for NOx is 40 tpy. As shown in Table 3-1 above, the total estimated facility-wide emission rate of NOx is 98.3 tpy. Therefore, PSD is triggered for NOx as well. The remaining PSD-regulated pollutants (i.e., CO, SO_2, $PM/PM_{10}/PM_{2.5}$, and H_2S) have total emissions less than their respective PSD significance thresholds; therefore, the Deepwater Port Facility is considered minor with respect to PSD for these pollutants. Note that, although GHG (CO_2e) is a PSD-regulated pollutant, it does not have a defined significance threshold.

For those regulated pollutants that trigger PSD review, the following analyses are required:

1. Best Available Control Technology (BACT) analysis for each pollutant emitted in significant amounts, per §52.21(j)(2);
2. Off-property impacts analysis, demonstrating compliance with the National Ambient Air Quality Standard (NAAQS) and maximum allowable increase over the baseline concentration in the area ("increment") per §52.21(k). An appropriate air quality model must be used per §52.21(l). Pre-application PSD significance modeling would be performed, first, per §52.21(m);
3. Additional impact analyses, per §52.21(o); and
4. Federal Class I Area impact analysis, per §52.21(p).

These PSD analyses were performed for VOC and NOx as described in the following sections of this application. Note that there is no *de minimis* air quality level (i.e., SIL) provided for ozone, although demonstration of the ozone NAAQS is required. Therefore, per §52.21(i)(5)(i) [see Note to Paragraph (c)(50)(i)(f)], for any net emissions increase of 100 tons per year or more of VOC or NOx subject to PSD, the applicant is required to perform an ambient impact analysis, including the gathering of ambient air quality data. The ozone impacts analysis is provided in Section 7.0 of this application.

5.0 FEDERAL (TOP-DOWN) BACT ANALYSIS

For projects subject to PSD permitting, the federal Clean Air Act (42 U.S.C. § 7475(a)(4)) and federal Prevention of Significant Deterioration (PSD) regulations (40 CFR 52.21) require that Best Available Control Technology (BACT) be installed on new emissions units and existing affected emissions units that are modified by a Project, with regard to the pollutants for which PSD is triggered. As described in Section 4.0 of this application, the proposed Deepwater Port Facility is subject to PSD permitting for VOC and NOx emissions. This section presents the required control technology review for the proposed project's emissions units that are subject to PSD permitting. A general discussion of the BACT analysis procedure is presented followed by top-down BACT analyses for the affected emission units.

5.1 General BACT Overview

BACT Applicability

Applicability of BACT is required by 40 CFR 52.21(j)(2) as follows:

> *"A new major stationary source shall apply best available control technology for each regulated NSR pollutant that it would have the potential to emit in significant amounts."*

The regulated NSR pollutants for which the Project will result in a significant net emissions increase are VOC and NOx, for which a BACT analysis is required. The constructed emission units addressed in this BACT are:

1) Marine Loading of Crude
2) Diesel Storage Tanks
3) Crude Surge Tank
4) Diesel Engines

Fugitive equipment leaks will not be formally addressed by this BACT analysis as total fugitive emissions (i.e., platform + SPMs) are estimated to be 0.56 tpy VOC (see Table 3-1) and any stringent controls will be cost prohibitive, easily exceeding $17,860 per ton of VOC controlled if assuming a conservatively low annualized capital cost of only $10,000. Compliance with applicable regulations combined with good engineering design and work practices will be the only feasible control options for fugitive emissions, both of which will be implemented.

BACT Methodology

According to 40 CFR 52.21(b)(12), BACT "*means an emissions limitation* […] *based on the maximum degree of* [achievable emissions control] *taking into account energy, environmental, and economic impacts and other costs*." BACT can be add-on control equipment or can be a specified equipment design or process methods, such as work practices or combustion techniques. Over time, the U.S. EPA has interpreted the determination of BACT to require an analysis that addresses two core criteria:

1. A BACT analysis must include consideration of the most stringent available technologies (i.e., those that provide the "maximum degree of emissions reduction"); and

2. Any decision to require as BACT a control alternative that is less effective than the most stringent available must be justified by an analysis of objective indicators showing that energy, environmental, and/or economic impacts render the most stringent alternative unreasonable or otherwise not achievable.

U.S. EPA developed what is known as the "top-down" approach for conducting BACT analyses and has indicated that this approach should produce a BACT determination satisfying the above two core criteria. Under the "top-down" approach, progressively less stringent control technologies are analyzed until a level of control considered BACT is determined, based on the most effective control option that is determined to result in acceptable environmental, energy, and economic impacts.

The top-down BACT analysis methodology consists of five steps:

1. Identify all "available" control options that might be utilized to reduce emissions of the subject pollutant for the type of source/unit subject to BACT.

2. Eliminate those available options that are technically infeasible to apply to specific emissions unit(s) under consideration.

3. Rank the remaining technically feasible control options by control effectiveness.

4. Evaluate economic, energy and/or environmental impacts of each remaining control option as applied to the subject emissions unit, rejecting those options for which the adverse impacts outweigh the beneficial impacts.

5. Based on the most effective control option not rejected in Step 4, select an emission limit or work practice as BACT, reflecting the level of control continuously achievable with the selected control option.

40 CFR 52.21(b)(12) also states that "*in no event shall application of* [BACT] *result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60* [NSPS] *and 61* [NESHAP]", and presumably also any other federal program such as part 63]. In cases in which the regulatory requirement specified by one of these NSPS, NESHAP, or other required air programs is the top control, the full top-down evaluation is deemed to be unnecessary.

Technical Feasibility Analysis

As described in the U.S. EPA's *draft* 1990 New Source Review (NSR) Workshop Manual, and in the 2018 update to this manual, determining whether a control technology is technically feasible is straightforward for those that have already been demonstrated. Control technologies that have been installed and operated successfully on the type of source under BACT would be technically feasible. For determining whether undemonstrated control technologies are technically feasible, the NSR Workshop Manual identifies the two key concepts to consider are "availability" and "applicability". A technology is considered "available" if it can be obtained commercially or is otherwise available within the common sense meaning of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under consideration. A technology that is both available and applicable is technically feasible.

The technical feasibility of each available control option should be assessed by an applicant with the final decision being delegated to the reviewing authority. In the absence of a review of technical feasibility by the applicant for a given control technology, it will be presumed that the technology is technically feasible. When an available, but emerging, control technology has not yet been demonstrated to be technically feasible, the applicant cannot be compelled by the reviewing authority to delay project implementation for the purpose of allowing further research and development to potentially demonstrate technical feasibility.

Economic Analysis

The economic impacts are most commonly represented by a cost effectiveness parameter, which is expressed as an annualized dollar cost per ton of pollutant abated. The NSR Workshop Manual states that the "*average cost effectiveness (total annualized costs of control divided by annual emission reductions* […] *is a way to present the costs of control".* In other words, the cost effectiveness value can be viewed as the annualized cost to reduce a single ton of pollutant.

In this analysis, any required economic evaluations are based on budget estimates. If the top feasible control alternative is selected as BACT, then an economic evaluation is not necessary. However, if the selected BACT control option is not the top <u>technically</u> feasible control alternative, then in accordance with EPA's BACT guidelines, a cost effectiveness calculation and/or a review of energy and environmental impacts for the top technically feasible option will be presented, as required, to demonstrate that the top option is either economically infeasible and/or that it should be rejected due to adverse energy or environmental impacts.

Identification of Emission Control Technologies

A review of the U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC) database was performed to identify emission control strategies relevant to emission units of the proposed Project. The RBLC database query can be found in Appendix C to this PSD application. Other references and sources were consulted to identify top emission controls, such as pollution control experts, vendors, published technical information, and BACT determinations approved by state and federal environmental agencies that may not yet have been incorporated into the RBLC database.

BACT Baseline

Emission units to be constructed or modified as part of the Project will be subject to applicable NSPS rules under 40 CFR Part 60 and/or applicable NESHAP rules under 40 CFR Part 63. For these units, and for the pollutants to which these standards apply, the applicable NSPS and NESHAP emission limitations establish the minimum allowable (least stringent) emission limitations or a "baseline" or "floor" for the BACT analysis. The performance, feasibility, and costs of more stringent control options evaluated for possible application to the emissions units must be compared to these baselines.

Consideration of Inherently Lower Polluting Processes/Practices

EPA does not consider that the chosen BACT technology should be a means to "redefine the design of the source" as described in the NSR Workshop Manual, and especially not to redefine the overall purpose of the proposed facility. However, consideration of alternative production processes is an expected part of a BACT analysis in some cases where such technologies may be available. An example would be consideration of natural gas-fired electric turbines where an applicant is proposing higher-polluting coal-fired electric generators. Combining inherently lower-polluting processes/practices and add-on controls usually will provide a higher level of emissions control than employing either technology alone. Therefore, the availability of an alternative process/practice does not exclude the need to also include available add-on control technologies in a BACT analysis.

5.2 Summary of Proposed BACT

Table 5-1 presents a summary of proposed BACT for the emission sources of the proposed Project. Details of the BACT analyses are presented in the following sections.

Table 5-1: Summary of Proposed Federal BACT

Emissions Unit Category	Pollutant	BACT Selection
Ship Loading	VOC	• Submerged Loading, and • Implementation of ship-specific VOC Management Plans in compliance with the requirements of MEPC.185(59).
Platform and SPM Buoy Fugitives	VOC	• Compliance with applicable regulations, and • Good engineering design and work practices.
Diesel Tanks	VOC	• Fixed roof tanks, • Tanks painted white, • Equipped with submerged fill pipes, and • Maintain compliance with applicable regulatory work practices.
Crude Surge Tank	VOC	• Fixed roof tank, • Tank painted white, • Equipped with submerged fill pipe, and • Maintain compliance with applicable regulatory work practices.

Emissions Unit Category	Pollutant	BACT Selection
Diesel Engines (Generators, Firewater Pump, Portal Crane)	VOC	• Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ, and • Good combustion practices.
	NOx	• Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ, and • Good combustion practices.

5.3 Ship Loading – VOC BACT

Loading losses from marine vessels (ships) are the primary source of evaporative emissions from the proposed Project. Loading losses occur when organic vapors in "empty" vessels are vented to the atmosphere by the liquid being loaded into the vessel.

Step 1: Identify Available Control Options

A search of the RBLC database for “offshore” loading of ships across all available types of industries yielded no results of BACT determinations, dating back to January 2009. The following control options are the identified available Ship Loading VOC control options for Step 1 of the top-down review based on an RBLC database search of facilities known to be at onshore locations:

- Vapor Combustion Unit (VCU)
- Vapor Recovery Unit (VRU)
- Submerged Loading
- VOC Management Plan (implemented by the ship)

Vapor Combustion Unit (VCU)
With this technology, emissions from the ship loading operation would be captured and routed to a combustion device for destruction, such as vapor combustors or a flare. A VCU has its own negative environmental effects of producing other combustion products including NOx, CO, SO_2, PM, and CO_2. A VCU would also require combustion of additional hydrocarbons as pilot gas and enrichment gas, thereby creating even more emissions.

Vapor Recovery Unit (VRU)
In a VRU, emissions are captured as vapors and condensed back to liquid phase by refrigeration, absorption, adsorption, and/or compression, then returned to the emitting vessel. Additional emission sources such as engines would be required to provide the necessary mechanical power for the vapor condensing equipment and to pump recovered liquids.

Submerged Loading
Submerged loading is a loading method in which the fill pipe is extended close to the bottom of the ship’s cargo tank prior to beginning the loading process. During most of the loading process, the fill pipe opening is below the liquid surface level (i.e., submerged). The alternative loading

method is known as “splash loading” in which the fill pipe is only partially lowered into the cargo tank and significant turbulence and vapor/liquid contact occurs during the loading process, thereby generating significantly more emissions than submerged loading. Submerged loading greatly reduces VOC emissions by avoiding disturbance of the liquid surface and the creation of aerosol droplets due to splashing.

VOC Management Plan

A VOC Management Plan is required for all ships transporting crude oil as mandated by regulation 15.6 of the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI. The VOC Management Plan must at a minimum cover the specific points in the regulation and the plan must be approved by the governing authority. Guidelines for the development of VOC Management Plans is given in Marine Environmental Protection Committee Resolution 185(59) (MEPC.185(59)) and additional information on systems and operations of VOC Management Plans is given in MEPC.1/Circ.680.

The regulation requires that VOC-generating vessels be specifically evaluated, and procedures written, to ensure that ship operations follow best management practices for preventing or minimizing VOC emissions to the extent possible. Rule 1.4. of the VOC Management Plan Guideline (MEPC.185(59)) states that while maintaining the safety of the ship, the VOC Management Plan should encourage and, as appropriate, set forth the following best management practices:

1. Loading procedures should take into account potential gas releases due to low pressure and, where possible, the routing of oil from crude oil manifolds into the tanks should be done so as to avoid or minimize excessive throttling and high flow velocity in pipes;

2. The ship should define a target operating pressure for the cargo tanks. This pressure should be as high as safely possible, and the ship should aim to maintain tanks at this level during the loading and carriage of relevant cargo;

3. When venting to reduce tank pressure is required, the decrease in pressure in the tanks should be as small as possible to maintain the tank pressure as high as possible;

4. The amount of inert gas added should be minimized. Increasing tank pressure by adding inert gas does not prevent VOC release, but it may increase venting and, therefore, increased VOC emissions; and

5. When crude oil washing is considered, its effect on VOC emissions should be taken into account. VOC emissions can be reduced by shortening the duration of the washing or by using a closed cycle crude oil washing program.

In addition, the VOC Management Plan should further consider and address a Responsible Person for implementing the plan, procedures for minimizing emissions from specified types of operations, use of VOC reduction devices with which the ship is equipped, and training programs.

Step 2: Eliminate Technically Infeasible Control Options

Vapor Combustion Unit (VCU)

VCU control technology has been demonstrated as technically feasible in land-based applications, but not in offshore locations like the proposed Single Point Mooring (SPM) buoy system. The offshore location, weather conditions, and sea conditions present many challenges that render VCU control technology infeasible due to safety and energy concerns, and this technology is considered undemonstrated for offshore applications:

- An enrichment system would be required by a VCU to ensure that the recovered vapors have sufficient heat of combustion to be efficiently destroyed by the VCU. Since no fuel gas pipeline providing suitable enrichment gas would be readily present in the remote offshore location, a VCU system would require significant storage of propane on the platform. Propane transportation from shore to a platform would be required for refueling, thus requiring further expended energy and emissions by transport vessels on a very frequent basis. Those additional emissions coupled with the additional emissions of combustion products (enrichment/pilot gas) as an alternative to just the VOC emissions from loading operations alone could outweigh the benefits of a VCU installation. It is also uncertain how reliably propane could be transported to such remote locations at sea at the frequent intervals which would be required, leading to potential significant delays in operations which could further exacerbate emissions if tanker vessels have to spend extra time "jogging" engines at sea while waiting to receive loads of crude oil once a depleted propane supply is replenished for VCU operation.

- A vapor gas blower would be required to transfer vapor from the crude oil tanker back to the VCU on a platform. The size/power of the blower needed for a VLCC would be multitudes larger than any installation known to currently be used on a VLCC. An installation of this magnitude would require a great deal of research and design since it has not already been demonstrated. In addition, the blower would require electrical energy from shore, or generation using a gas turbine. If placed on the platform, storage of fuel would be required (propane or liquid fuels). A significant footprint and equipment cost would be associated with this option.

- A vapor collection system would be required that returns collected vapors back to the SPM buoy, down to a subsea pipeline, and then to the VCU located on the platform. Such a vapor collection system has not been demonstrated and could present unique challenges due to the lengthy distance these vapor lines would have to traverse underwater to allow adequate clearance of the established swing circle around the SPM buoy which must accommodate ships that weathervane around it. An underwater vapor collection line traveling distances such as these could potentially lead to condensing vapors in the lines which would present operational reliability and safety issues.

- Vapor combustors or flares require a large thermal safety zone from other structures and personnel, due to being a large heat source. Such safety concerns could present unforeseen challenges in an offshore platform location where space is often limited/confined.

Based on the stated technical issues, VCU control technology is not an “applicable” technology for the proposed SPM buoy system and is, therefore, eliminated from consideration as a control option due to technically infeasibility and safety reasons.

<u>Vapor Recovery Unit (VRU)</u>

VRU control technology has been demonstrated as technically feasible in land-based applications, but not in offshore locations like the proposed SPM buoy system. The offshore location, weather conditions, and sea conditions present many challenges that render VRU control technology infeasible due to safety and energy concerns and is considered undemonstrated technology for offshore applications as discussed below:

- VRU control technology is not typically used for crude oil vapors due to the difficulties presented by the wide and variable range of compounds found in crude oils and their non-uniform chemical properties. For a condensation-based VRU system (compression/refrigeration), some of the chemicals in crude oil vapor would be condensed easily, but others would require either much greater compression power due to higher vapor pressures and/or more refrigeration power due to lower boiling points – this is especially true for chemicals such as ethane, propane, butane, and hydrogen sulfide. Similar difficulties are also encountered by adsorption/absorption systems, such as carbon adsorption systems, used to control emissions from crude oil vapors since lighter compounds are not well-controlled and the adsorption capacity is much less for these compounds. Many of the heavier compounds in crude oil vapors will sometimes “poison” the carbon requiring complete replacement. Certain compounds in crude oil will cause excessive heat generated by exothermic reactions resulting from capture on the carbon, potentially leading to fires/explosions, which are a great safety concern. Further, such systems have not yet been demonstrated on a scale the size of the proposed VLCC loading and in an offshore setting. Existing applications of VRU technology for crude oil have experienced little success and have limited availability.

- A vapor gas blower would be required to transfer vapor from the crude oil tanker back to the VRU on the platform. The size/power of the blower needed for a VLCC would be multitudes larger than any installation known to currently be used on a VLCC. An installation of this magnitude would require a great deal of research and design since it has not already been demonstrated. In addition, the blower would require electrical energy from shore, or generation using a gas turbine. If placed on the platform, storage of fuel would be required (propane or liquid fuels). A significant footprint and equipment cost would be associated with this option.

- A vapor collection system would be required that returns collected vapors back to the SPM buoy, down to a subsea pipeline, and then to the VRU located on the platform. Such a vapor collection system has not been demonstrated and could present unique challenges due to the lengthy distance these vapor lines would have to traverse underwater to allow adequate clearance of the established swing circle around the SPM buoy which must accommodate ships that weathervane around it. An underwater vapor collection line traveling distances such as these could potentially lead to condensing vapors in the lines, which would present operational reliability and safety issues.

Based on the stated technical difficulties, VRU control technology is not an “applicable” technology for the proposed SPM buoy system and is, therefore, eliminated from consideration as a technically infeasible control option.

Step 3: Rank Remaining Technically Feasible Control Options

The remaining two technically feasible control options in order of effectiveness are submerged loading and loading to ships that implement VOC Management Plans. Submerged loading achieves a control efficiency of more than 60% based on an evaluation of saturation factors found in AP-42 Table 5.2-1 (6/08). The control efficiency of loading to ships implementing VOC Management Plans is not easily quantifiable.

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

Submerged loading is the most effective remaining feasible control option and Texas GulfLink will implement this control option, so a cost analysis is not required. Loading to ships implementing VOC Management Plans is the baseline BACT option, so no further analysis of it is required.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of VOC from ship loading operations a combination of submerged fill loading and loading to ships that implement ship-specific VOC Management Plans in compliance with the requirements of MEPC.185(59).

5.4 Diesel Storage Tanks – VOC BACT

Steps 1 – 3: Identify and Rank Control Options

As required by Steps 1 – 3 of the top-down review, based on an RBLC database search, the following control options were identified for Diesel Storage Tank VOC emissions, ordered by effectiveness, and of which all are technically feasible:

- Fixed roof tank
- Submerged fill pipe
- Tank painted white
- Compliance with applicable regulatory work practices

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

Texas GulfLink will implement the above identified control technologies. Therefore, further analyses of economic, energy, and/or environmental impacts were not necessary.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of VOC from Diesel Storage Tanks a combination of fixed roof tanks, painted white, equipped with submerged fill pipes, and maintaining compliance with applicable regulatory work practices.

5.5 Surge Tank (Crude Oil Service) – VOC BACT

Steps 1 – 3: Identify and Rank Control Options

A search of the RBLC database for "surge" or "relief" tanks across all available types of industries yielded no results of BACT determinations dating back to January 2009. Surge/relief tanks are different from traditional storage tanks since they do not typically hold liquids during normal operations. These tanks will receive liquids only during a sudden surge event for which the tank will serve as "relief" and quickly receive the excess liquids for a brief period prior to being returned to the pipeline. The surge tank will not typically contain any crude oil. Due to the inherently low emissions due to the tank normally not containing stored material, Texas GulfLink conservatively identified the same control options for the Crude Oil Surge Tank as were identified for the Diesel Storage Tanks, ordered by effectiveness, and of which all are technically feasible:

- Fixed roof tank
- Submerged fill pipe
- Tank painted white
- Compliance with applicable regulatory work practices

The VCU and VRU control technologies previously described for ship loading would be considered technically infeasible for use on the crude surge tank, for the reasons already discussed. These control technologies would also be cost prohibitive for controlling the expected low emissions of less than 1.7 tons/yr VOC from the surge tank (see Table 3-1).

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

Texas GulfLink will implement all identified and technically feasible control technologies for VOC emissions from the Surge Tank and, therefore, further analyses of economic, energy, and/or environmental impacts were not necessary.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of VOC emissions from the Crude Oil Surge Tank a combination of fixed roof tank, painted white, equipped with submerged fill pipe, and maintaining compliance with applicable regulatory work practices.

5.6 Diesel Engines – VOC BACT

The electric generators, portal crane, and firewater pump for the proposed Project will be driven by diesel-fired internal combustion engines. This section addresses VOC BACT controls for all of these emission sources.

Steps 1 – 3: Identify and Rank Control Options

As required by Steps 1 – 3 of the top-down BACT review, based on a RBLC database search, the following control options were identified for control of VOC emissions from Diesel Engines, ordered by effectiveness, and of which all are technically feasible:

- Oxidation Catalyst, 60% control efficiency
- Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ
- Good Combustion Practices

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

<u>Oxidation Catalyst</u>
The addition of a catalyst bed to the exhaust outlet of an engine causes significant pressure drop and backpressure to the engine. This reduces the power/energy efficiency of the engine. The oxidation catalyst causes reactions with CO and VOC in the exhaust further converting them to CO_2, which is released to the atmosphere as additional collateral emissions. The waste generated by spent catalyst must be replaced approximately every 5 years and disposed of potentially as a hazardous waste. Further, the cost of the Oxidation Catalyst for the proposed generators would be prohibitive, at approximately $211,000/ton (see Appendix D for details of the cost analysis). This cost is based on the conservative assumption of year-round (i.e., 8,760 hrs/yr) operation of each unit, which would not actually be the case. Because typically only one of the two Generator engines (with two oxidation catalyst beds) would be in use, each Generator would have a half-year operating factor, on average, when considering combined run-time of both units. So, the actual cost would be approximately $422,000/ton of VOC reduced. These adverse environmental and economic impacts outweigh the advantages, so installing Oxidation Catalysts is rejected as a VOC control option for all of the diesel-fired engines.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of VOC from Diesel Engines a combination of good combustion practices and compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ.

5.7 Diesel Engines – NOx BACT

The electric generators, portal crane, and firewater pump for the proposed Project will be driven by diesel-fired internal combustion engines. This section addresses NOx BACT controls for all of these emission sources.

Step 1: Identify Available Control Options

The following control options are the identified available control options for Step 1 of the top-down BACT review based on an RBLC database search:

- Fuel Selection
- Add-on controls such as Selective Catalytic Reduction (SCR), Selective Non-Catalytic Reduction (SNCR), or Non-Selective Catalytic Reduction (NSCR)
- Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ
- Good Combustion Practices

Step 2: Eliminate Technically Infeasible Control Options

Fuel Selection

Natural gas-fired engines can provide for lower NOx emissions performance as compared to diesel-fired engines. As previously discussed related to complexities with a VCU for ship loading, no fuel gas pipeline, such as a natural gas or propane pipeline, would be readily present in the remote offshore location of the proposed project. Therefore, natural gas-fired engines would require significant storage of the fuel on the platform, creating the same reliability issues as previously discussed for a VCU. Diesel fuel can be more reliably and efficiently transported (from an energy and emissions perspective) to the offshore location. For these reasons, fuel selection is a technically infeasible control option. Diesel fuel is proposed for the engines.

Add-on Controls Such as SCR, SNCR, or NSCR

SCR technology normally is effective for treating flue gases in the temperature range of approximately 450°F to 850°F and it requires stable temperatures with sustained run times for effective NOx emissions control. The crane and firewater pump engines will typically run for only several hours per week and/or with frequent load fluctuations causing unstable stack temperatures. For these reasons, SCR is eliminated from further consideration as a technically feasible NOx control option for the crane and firewater pump engines. For the electric generator engines, which will experience more sustained run times, SCR will be further evaluated as a potential technically feasible NOx control option.

SNCR technology is normally effective for treating flue gases in the temperature range of approximately 1,600°F to 1,900°F. Engines typically have maximum exhaust manifold temperatures well below the usual effective operating range of SNCR, reaching up to approximately 1,100°F. For this reason, SNCR is eliminated from consideration as a technically feasible control option.

To be effective, NSCR technology requires a fuel-rich vapor stream with very low oxygen content. Diesel engines inherently operate "lean" with higher oxygen and lean levels of fuel in the exhaust. Therefore, NSCR is not effective for NOx reduction in diesel engine exhaust, and is eliminated from consideration as a technically feasible NOx control option.

Step 3: Rank Remaining Technically Feasible Control Options

The remaining technically feasible control options in order of effectiveness are:

- SCR (Generator engines only)
- Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ
- Good Combustion Practices

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

<u>SCR (Generators only)</u>
SCR technology creates collateral emissions of ammonia due to requiring injection of ammonia or urea into the exhaust stream upstream of the catalyst. Some of the ammonia passes through unreacted, which is known as "ammonia slip". Another adverse environmental impact is the waste generated by spent catalyst from the SCR unit which must be replaced, for typical operations, approximately every three years and disposed of as a hazardous waste. Storing ammonia on the offshore platform and the ammonia slip from the SCR unit would create safety concerns for the personnel in close proximity (i.e., those living on the platform) since ammonia is toxic and can cause irritation and burning of the skin, eyes, nose, and throat. Further, the cost of SCR technology for the proposed Generators would be prohibitive, at approximately \$11,000/ton (see Appendix D for details of the cost analysis). This cost is based on the conservative assumption of year-round (i.e., 8,760 hrs/yr) operation of each unit, which would not actually be the case. Because typically only one of the two generators (with two SCR units) would be in use, each generator would have a half-year operating factor, on average, when considering the combined run-time of both units. So, the actual cost would be approximately \$22,000/ton of VOC reduced. Based on these health, environmental, and economic reasons, SCR is rejected as a feasible control option for NOx emissions from the Generators because these disadvantages are deemed to outweigh any benefit.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of NOx emissions from the Generator diesel engines a combination of good combustion practices and compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ.

6.0 REGULATORY APPLICABILITY

In this section, potentially applicable federal and state air regulations are reviewed for the proposed Texas GulfLink Deepwater Port Facility. Note that the US Environmental Protection Agency (EPA) does not normally administer the Clean Air Act (CAA) in the western Gulf of Mexico because under CAA Section 328, the Department of lnterior's Bureau of Ocean Energy Management (BOEM) is responsible for regulating outer continental shelf (OCS) sources, as defined by the OCS Lands Act, in that area. However, because the proposed Deepwater Port Facility will not be a defined OCS source, Section 328 does not apply. Instead, the EPA is the CAA permitting authority for non-OCS sources in federal waters.

The EPA regards a provision of the Deepwater Port Act (DPA), 33 U.S.C. §1501, *et seq,* as the primary source of its authority to apply the CAA to activities associated with deepwater ports. The DPA applies federal law, and applicable State law, to deepwater ports and further designates deepwater ports as "new sources" for CAA purposes. Accordingly, for the source's pre-construction and operating permits, EPA will rely on the provisions of Title I and Title V, respectively, of the CAA supporting applicable regulations, and on the State's law to the extent applicable and not inconsistent with federal law.

Section 6.1 below describes the potentially applicable federal air regulations in Title 40 of the Code of Federal Regulations (40 CFR). Section 6.2 below describes the potentially applicable Texas air regulations in Title 30 of the Texas Administrative Code (30 TAC), as administered by the Texas Commission on Environmental Quality (TCEQ).

6.1 Federal Air Regulations – 40 CFR

The federal air regulations reviewed include New Source Performance Standards (NSPS) in 40 CFR Part 60, National Emission Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR Part 61, and NESHAP for Source Categories (which outlines Maximum Achievable Control Technology, "MACT") in 40 CFR Part 63. Note that the applicability of 40 CFR Parts 70/71 (federal Title V) is included under separate cover.

NSPS – 40 CFR Part 60

Subpart A: General Provisions
Any emission source subject to a specific NSPS is also subject to applicable general provisions in this subpart. Unless specifically excluded by the source-specific NSPS, Subpart A generally requires initial construction notification, initial startup notification, performance tests/notifications, general monitoring requirements, general recordkeeping requirements, and semi-annual monitoring and/or excess emission reports. Because the proposed Texas GulfLink Deepwater Port Facility will be subject to one or more source-specific NSPS, the facility will comply with the applicable general provisions under Subpart A.

Subparts D, Da, Db, Dc: Steam Generating Units

The proposed Deepwater Port Facility will not operate a defined steam generating unit (SGU). Therefore, these rules that apply to SGUs do not apply.

Subparts Kb: Petroleum Liquid Storage Vessels Constructed, Reconstructed, or Modified after July 23, 1984

This subpart applies to a storage vessel with a capacity greater than or equal to 20,000 gallons that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification commenced after July 23, 1984. However, the subpart does not apply to a storage vessel with a capacity greater than or equal to 40,000 gallons storing a liquid with a maximum true vapor pressure (TVP) less than 0.5 psia, or with a capacity between 20,000 and 40,000 gallons storing a liquid with a maximum TVP less than 2.2 psia.

Although the proposed crude surge tank at the Deepwater Port Facility [EPN (P) T-1] will have a capacity greater than 40,000 gallons, it will not be operated as a storage tank. Surge/relief tanks are different from traditional storage tanks since they do not typically hold liquids during normal operations. Such tanks will receive liquids only during a sudden surge event for which the tank will serve as "relief" and quickly receive the excess liquids for a brief period prior to being returned back to the pipeline. The surge tank will not typically contain any crude oil. Therefore, this subpart does not apply to the surge tank. Additionally, the proposed fixed roof diesel-fuel storage tank [EPN (P) DT-1] will have a storage capacity of 20,000 gallons, but the TVP of diesel is significantly less than 2.2 psia. Therefore, the diesel-fuel tank will also not be subject to this rule. Finally, the "belly" tanks shown in the emission calculations are tanks that are part of the electric generators, portal crane, and firewater pump engine housing. They are not considered stand-alone tanks and are not subject to this regulation.

Subpart GG: Gas Turbines

The proposed Deepwater Port Facility will not operate a stationary gas turbine. Therefore, this rule does not apply.

Subpart IIII: Stationary Compression Ignition IC Engines

This subpart applies to compression ignition (CI) engines. There will be a total of 4 CI engines located at the Deepwater Port Facility, driving 2 electric generators, 1 emergency firewater pump, and 1 portal crane. All 4 engines will be constructed after the applicable date of July 11, 2005. Therefore, the Deepwater Port Facility will comply with the applicable provisions of this subpart for the 4 CI engines.

Subpart JJJJ: Stationary Spark Ignition IC Engines

This subpart applies to spark ignition (SI) engines. The proposed Deepwater Port Facility will not operate any SI engines. Therefore, this rule does not apply.

Subpart KKKK: Stationary Combustion Turbines

The proposed Deepwater Port Facility will not operate a stationary combustion turbine. Therefore, this rule does not apply.

NESHAP – 40 CFR Part 61

Subpart A: General Provisions
Any emission source subject to a specific NESHAP is also subject to applicable general provisions in this subpart. The proposed Deepwater Port Facility will have emissions of benzene as a result of handling and storing crude oil. Benzene is a listed applicable substance in 40 CFR 61.01(a). Therefore, a review of potentially applicable NESHAP rules was performed for the facility's emission sources.

Subpart V: Equipment Leaks of VHAP Service
The crude to be handled and loaded at the proposed Deepwater Port Facility will contain benzene at less than 10% by weight. As such, the pipeline components regulated by this subpart (e.g. valves, connectors, pumps, pressure relief devices, sampling connection systems, etc.) will not operate "In VHAP Service", as defined in 40 CFR 61.241. Therefore, this subpart does not apply. As there are no other applicable NESHAP rules that apply to the Deepwater Port Facility, Subpart A does not apply as well.

NESHAP for Source Categories ("MACT") – 40 CFR Part 63

Subpart A: General Provisions
This subpart applies to any facility that is subject to an individual subpart under 40 CFR 63. Because the diesel (compression ignition) engines at the proposed Deepwater Port Facility will be subject to Subpart ZZZZ, the facility will comply with applicable requirements in Subpart A.

Subpart H: Equipment Leaks of Organic HAPs
The provisions of this subpart apply to pumps, compressors, agitators, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, instrumentation systems, and control devices or closed vent systems required by this subpart that are intended to operate in organic HAP service 300 hours or more during the calendar year within a source subject to the provisions of a specific subpart in 40 CFR part 63 that references this subpart. No Part 63 subpart that applies to the Deepwater Port Facility references this Subpart H. Additionally, the facility will not operate pipeline components "In Organic HAP" service (i.e., piece of equipment either contains or contacts a fluid that is at least 5% by weight of total organic HAP). Therefore, this subpart does not apply.

Subpart Y: National Emission Standards for Marine Tank Vessel Loading Operations
Texas Gulflink's proposed DWP is expected to emit greater than 10 tons per year (tpy) of a single hazardous air pollutant (HAP) and greater than 25 tpy of an aggregate of all speciated HAPs (see Table 3-2). Therefore, the facility is considered a major source of HAPs. For some marine tank vessel loading operations, 40 CFR Part 63, Subpart Y (referred to generally as "Subpart Y") provides the regulatory framework for setting HAP emissions limits. However, for the reasons stated below, Subpart Y does not apply to Texas GulfLink's proposed DWP. Rather, Texas GulfLink asserts that the HAP emissions from its proposed facility are more appropriately considered through a case-by-case MACT analysis (40 CFR Part 63, Subpart B), rather than under Subpart Y.

a. Hazardous Air Pollution Regulation

The Clean Air Act (CAA) section 112 authorizes the EPA to regulate the emission of HAPs. CAA section 112(d) requires EPA to promulgate regulations establishing emission standards for each category or subcategory of major sources listed by the EPA under Section 112(c) of the CAA (Listed Sources). The emission standards for Listed Sources are referred to as National Emission Standards for Hazardous Air Pollutants (NESHAP).

The NESHAP establish Maximum Achievable Control Technology (MACT) standards for setting emissions limits for new and existing Listed Sources. In those instances where EPA has not established a MACT standard applicable to a major source of HAPs (i.e. for sources that are not a Listed Source), CAA section 112(g) applies. Under section 112(g), the MACT emission limitation is developed on a "case-by-case" basis.

In 1995, EPA promulgated a specific MACT standard for HAP emissions from the "marine tank vessel loading operations" source category – a Listed Source. That standard is found in Subpart Y. Under Subpart Y, new, major "offshore loading terminals" are required to reduce HAP emissions from marine tank loading operations by 95 weight-percent. HAP emissions can be controlled using one of two primary methods: vapor recovery or vapor combustion (VR/VC). See 59 Federal Register 25004, 25007 (May 13, 1994).

However, VR/VC is an onshore or near-shore control technology that has never been achieved in practice at a DWP. VR/VC creates significant and unique human and environmental safety concerns at DWPs, especially those like Texas GulfLink that are located in unprotected waters and plan to use a manned platform for port security, surge protection and emergency/environmental response. Texas GulfLink proposes to control HAP emissions (i.e., volatile organic compounds, or "VOCs") during crude oil loading operations by using submerged fill loading under a VOC Management Plan adopted by the Marine Environment Protection Committee (MEPC), in MEPC.185(59) and MEPC.1/Circ. 680. Unlike VR/VC, VOC control plans represent emissions control strategies actually demonstrated and achieved in practice at DWPs.

Furthermore, and importantly, the proposed Texas GulfLink project does not meet the definition of an "offshore loading terminal" as that term is defined in Subpart Y. Therefore, Subpart Y is not applicable to Texas GulfLink's proposed project.

b. Texas GulfLink's Proposed DWP Does Not Meet the Definition of "Offshore Loading Terminal"

EPA's Subpart Y regulations define an "offshore loading terminal" in 40 CFR §63.561 as follows:

> *Offshore loading terminal means a location that has at least one loading berth that is 0.81 km (0.5 miles) or more from the shore that is used for* ***mooring*** *a marine tank vessel and loading liquids from shore*. (emphasis added)

A critical part of the definition of an offshore loading terminal is the need for at least one "loading berth." The term "loading berth" is defined as follows:

> *Loading berth means the loading arms, pumps, meters, shutoff valves, relief valves, and other piping and* ***valves necessary to fill marine tank vessels.*** *The loading berth includes those items* ***necessary for an offshore loading terminal****.* (emphasis added).

Finally, a "terminal" is defined as "all loading berths at any land or sea based structure(s) that loads liquids in bulk onto marine tank vessels." Based on these definitions, an *offshore* loading terminal subject to Subpart Y requires at least one loading berth at a sea based structure. The Texas GulfLink project will not be an offshore loading terminal as contemplated by these definitions.

The Texas GulfLink DWP will load tankers using an SPM buoy system. The tankers will be physically moored to the floating SPMs, not any platform. Once a ship is moored to the SPM, the oil is loaded directly into the crude oil tankers using 1,100-foot flexible hoses. The equipment "necessary" for Texas GulfLink to "fill marine tank vessels" or to "load liquids in bulk" include the pumps (located and controlled onshore), the subsea pipeline, the PLEMs, the SPMs, and the 1,100-foot flexible hoses connecting the SPMs to the tankers. There are no "loading arms" or "pumps" at the SPM, only the lengthy floating flexible cargo hoses. The SPM-system proposed by Texas GulfLink does not fall within the meaning of a loading berth.

Although it is part of the overall design of the Texas GulfLink project, the offshore fixed platform is not necessary for loading operations and not a loading berth. The flow of oil from shore to the tankers is driven by nine (9) mainline crude pumps and three (3) booster pumps located onshore and fully controlled from an onshore control room—not the platform. Likewise, system shut-off valves are located onshore downstream of the main pumps. There are no "loading arms" or "pumps" on the platform itself. In fact, no equipment critical to loading is located solely on the platform. The platform itself will be 1.25 nautical miles (1.43 miles) away from the 2 SPM buoys where the tankers are moored.

While all DWP applicants propose to load tankers in the same manner – via an SPM system, some DWP applicants, like Texas GulfLink, recognize the benefits of incorporating a manned platform (at significant additional cost) into their projects. The platform provides support in the event of a discharge, accident, pipeline surge, or security event. The platform will not be necessary to the loading operation conducted through the SPM, as evidenced by the DWP applicants that propose an SPM-only DWP.

c. <u>Case-by-Case MACT Analysis Under CAA 112(g)</u>

Because the platform does not constitute a "loading berth" and because the DWP project proposed by Texas GulfLink does not fit within the meaning of an "offshore loading terminal" as those terms are defined in Subpart Y, a case-by-case MACT analysis under CAA 112(g) is the technically and legally more appropriate approach for establishing an emissions limit. Further, under a case-by-case MACT analysis, the Texas GulfLink project can be evaluated based on the unique aspects of its proposed design while taking into account the safety and operational issues.

Subpart VV: Oil-Water Separators and Organic-Water Separators

The provisions of this subpart apply to the control of air emissions from oil-water separators and organic-water separators for which another subpart of 40 CFR 60, 61, or 63 references the use of this subpart for such air emission control. No Part 60, 61, or 63 subpart that applies to the proposed Deepwater Port Facility references Subpart VV. In addition, the facility will not operate an affected source under Subpart VV. Therefore, this rule does not apply.

Subpart YYYY: Stationary Combustion Turbines

The proposed Deepwater Port Facility will not operate a stationary combustion turbine. Therefore, this rule does not apply.

Subpart ZZZZ: Stationary Reciprocating Internal Combustion Engines (RICE)

The proposed Deepwater Port Facility will operate 4 compression ignition (CI) engines driving 2 electric generators (968 hp each), 1 emergency firewater pump (350 hp), and 1 portal crane (425 hp). Per 40 CFR 63.6590(c), an affected source that meets any of the criteria in paragraphs (c)(1) through (7) of the section must meet the requirements of Subpart ZZZZ by meeting the requirements of 40 CFR 60 (NSPS) Subpart IIII for compression ignition engines, and no further requirements apply under this subpart.

The emergency-use firewater pump engine [EPN (P) FWP-1] meets the applicability criteria of paragraph (c)(6) because it will be a new *emergency* stationary reciprocating internal combustion engine (RICE) with a site rating of less than or equal to 500 brake horsepower (bhp) located at a major source of hazardous air pollutant (HAP) emissions. Therefore, the engine will comply with Subpart ZZZZ by complying with 40 CFR 60 Subpart IIII, and no further requirements under Subpart ZZZZ apply.

Additionally, the portal crane engine [EPN (P) C-1] meets the applicability criteria of paragraph (c)(7) because it will be a new CI stationary RICE with a site rating of less than or equal to 500 bhp located at a major source of HAP emissions. Therefore, this engine will comply with Subpart ZZZZ by complying with 40 CFR 60 Subpart IIII, and no further requirements under Subpart ZZZZ apply.

Finally, the 2 electric generator engines [EPNs (P) G-1 and (P) G-2] do not meet the applicability of any of the (c)(7) paragraphs because each generator engine will have a power rating greater than 500 bhp and located at a major source of HAPs. Therefore, compliance with Subpart ZZZZ cannot be demonstrated solely by compliance with 40 CFR 60 Subpart IIII. These 2 engines will comply with applicable requirements of Subpart ZZZZ with respect to emission and operating limitations, testing, monitoring, recordkeeping, and reporting.

6.2 Texas Air Regulations – 30 TAC

As previously mentioned, for deepwater port license applications, the US EPA administers CAA requirements and reviews air permit applications using the nearest adjacent State's regulations. Because Texas is the nearest adjacent state to the proposed Deepwater Port Facility, the TCEQ rules and regulations would potentially apply to the Deepwater Port Facility. The TCEQ air quality regulations in 30 TAC Chapters 101 through 122 were reviewed for potentially applicable requirements.

Chapter 101: General Air Quality Rules

Chapter 101 covers general rules that may apply to the Deepwater Port Facility. Some items included in Chapter 101 are nuisance rules, inspection fees, emission fees, emission events, scheduled maintenance, and expedited permitting. The proposed Deepwater Port Facility will comply with applicable requirements listed in this chapter.

Chapter 111: Control of Air Pollution from Visible Emissions and Particulate Matter

Chapter 111 establishes standards for visible emissions and opacity from stationary vents, gas flares, ships, and other sources, and for particulate matter (PM) emissions from selected sources, including material handling and construction. In general, the opacity from a new stationary vent or stack must not exceed 20%, averaged over a 6-minute period. The opacity from a ship stack must not exceed 30%, averaged over a 5-minute period, except during reasonable periods of engine startup. Gas flares must not have visible emissions for more than 5 minutes in any consecutive 2-hour period. The Deepwater Port Facility will comply with applicable opacity and PM emission limits specified in this chapter.

Chapter 112: Control of Air Pollution from Sulfur Dioxide

Chapter 112 outlines emission limits as well as monitoring, reporting, recordkeeping requirements, and net ground-level concentration limits for sulfur compounds. The proposed Deepwater Port Facility will demonstrate compliance with the net ground-level concentration of applicable sulfur compounds (e.g. SO_2, H_2S) through air dispersion modeling analysis.

Chapter 113: Standards of Performance for Hazardous Air Pollutants and for Designated Facilities and Pollutants

Chapter 113 incorporates by reference the federal NESHAP for Source Category standards contained in 40 CFR Part 63. The applicability analysis for the federal NESHAP regulations is presented in Section 6.1.

Chapter 115: Control of Air Pollution from Volatile Organic Compounds

Chapter 115 establishes rules for VOC emissions from specific sources, including vent gases, loading, and unloading of VOCs. Chapter 115 applies to emission sources located in designated nonattainment counties, and specific covered attainment counties listed in §115.10. The requirements listed in Chapter 115 do not apply to the proposed Deepwater Port Facility because the facility will not be located in a designated nonattainment area, nor in one of the specifically listed attainment counties.

Chapter 116: Control of Air Pollution by Permits for New Construction or Modification

Through Chapter 116, the TCEQ administers the New Source Review (NSR) air permitting programs in Texas, including NNSR and PSD. However, for sources located on the OCS outside of the state seaward boundary, the US EPA administers the PSD (pre-construction) program, using adjacent state regulations. Therefore, Texas GulfLink is applying to the US EPA (Region 6) for a PSD permit prior to commencing construction.

Chapter 117: Control of Air Pollution from Nitrogen Compounds

Chapter 117 Subchapter B establishes emission limits for nitrogen compounds emitted from major industrial, commercial, and institutional sources located in ozone nonattainment areas. Because the proposed Deepwater Port Facility will not be located in a designated nonattainment area, the requirements of this chapter to not apply.

Chapter 118: Control of Air Pollution Episodes

Chapter 118 establishes requirements for generalized and local air pollution episodes. The requirements listed in Chapter 118 do not apply to the proposed Deepwater Port Facility because the facility's location will not be in any geographical area that might be affected by an air pollution episode.

Chapter 122: Federal Operating Permits Program

The proposed Texas GulfLink Deepwater Port Facility will be a major source of regulated pollutants (i.e., single pollutant with emissions greater than 100 tons per year, see Table 3-1); thus, it will require a federal Title V operating permit. For sources located on the OCS outside of the state seaward boundary, the US EPA administers the Title V permit program, using adjacent state regulations. Therefore, the Deepwater Port Facility is required to submit an initial Title V operating permit application to the US EPA (Region 6) prior to starting operation of the facility. This Title V permit application is included under separate cover.

7.0 AIR QUALITY IMPACTS ANALYSES

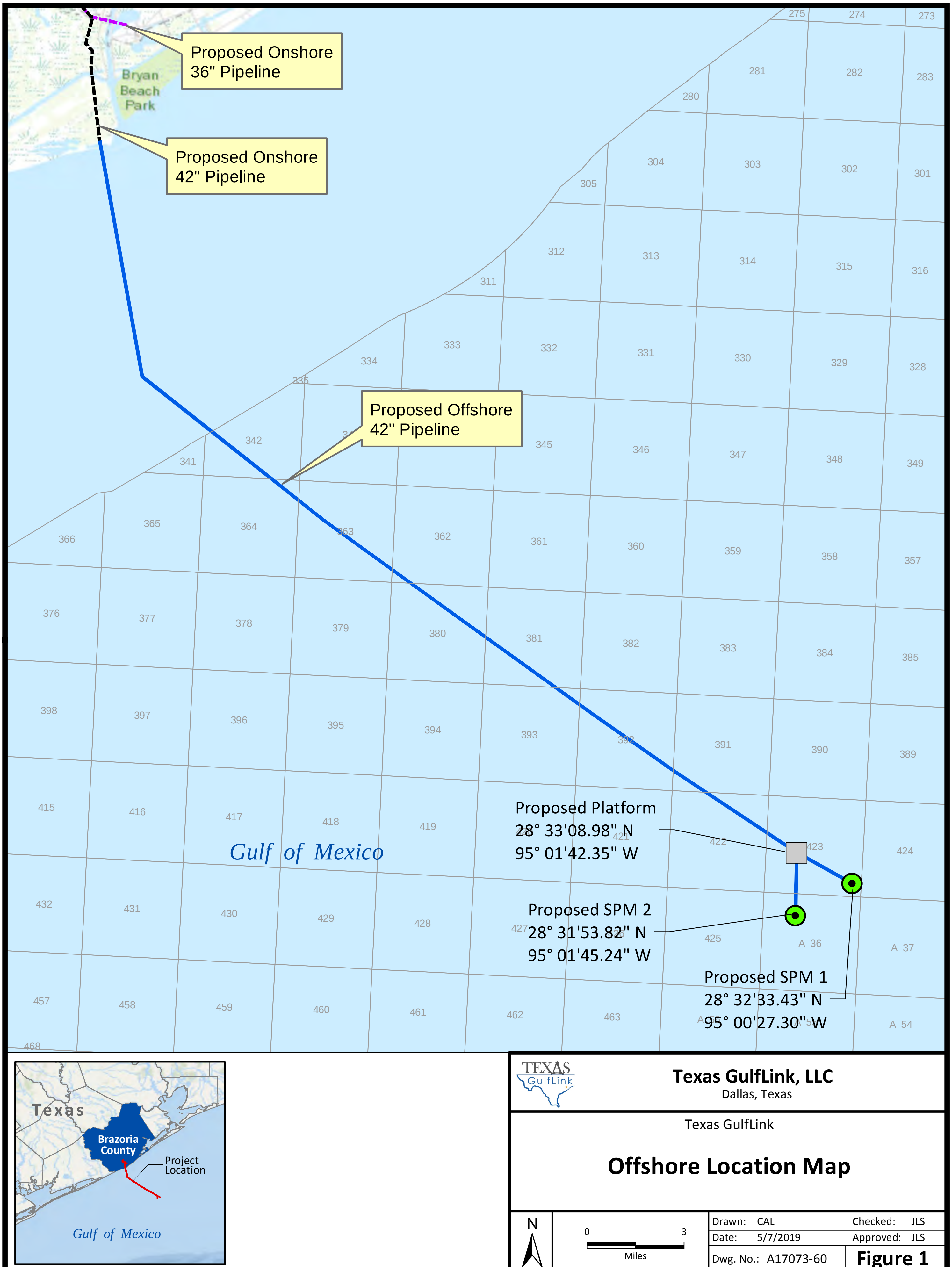
As described in Section 4.0 of this application, because the proposed offshore Deepwater Port Facility will have emissions of NOx and VOC that trigger PSD applicability, the following PSD air quality analyses were reviewed:

- Pre-application PSD significance modeling, per §52.21(m);
- Off-property impacts analysis, demonstrating compliance with the National Ambient Air Quality Standard (NAAQS) and maximum allowable increase over the baseline concentration in the area ("increment"), per §52.21(k);
- An additional impact analysis, per §52.21(o); and
- A federal Class I Area impact analysis, per §52.21(p).

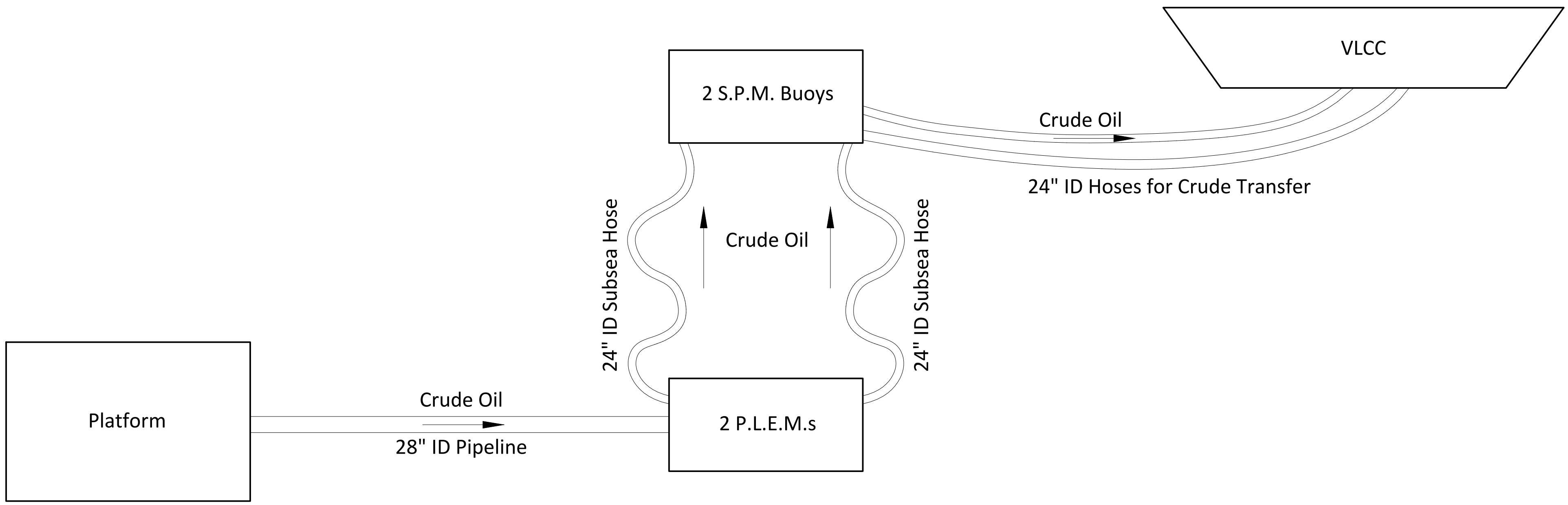
Appendix E presents a report describing the air quality analyses performed for the proposed Texas GulfLink Deepwater Port Facility (i.e., a major new source) following the PSD requirements. These analyses include dispersion modeling using the EPA-accepted Offshore and Coastal Dispersion (OCD) model, an ozone impacts review considering the two precursor pollutants to ozone formation, NOx and VOC, and a visibility screening analysis for the nearest Class II area (San Bernard Wildlife Refuge). Note that a Class I area impacts review was not required because the nearest Class I area (Breton National Wildlife Refuge in southeast Louisiana) is too far away to trigger such a review. Finally, because Texas is the "nearest adjacent coastal state" to the proposed Texas GulfLink offshore DWP facility, offsite impacts following Texas Commission on Environmental Quality (TCEQ) procedures were performed; namely, (1) a fence-line review of applicable sulfur compounds and (2) a health effects review for applicable compounds with defined Effects Screening Level (ESL) limits.

APPENDICES

Appendix A
Application Figures (Area Map, Simplified PFD)



Proposed Onshore 36" Pipeline
Bryan Beach Park
Proposed Onshore 42" Pipeline
Proposed Offshore 42" Pipeline
Proposed Platform
28° 33'08.98" N
95° 01'42.35" W
Proposed SPM 2
28° 31'53.82" N
95° 01'45.24" W
Proposed SPM 1
28° 32'33.43" N
95° 00'27.30" W
Gulf of Mexico
Texas
Brazoria County
Project Location
Gulf of Mexico
Texas GulfLink
Texas GulfLink, LLC
Dallas, Texas
Texas GulfLink
Offshore Location Map
N
0
3
Miles
Drawn: CAL
Checked: JLS
Date: 5/7/2019
Approved: JLS
Dwg. No.: A17073-60
Figure 1



Texas GulfLink, LLC
Dallas, Texas

Texas GulfLink

Simplified Process Flow Diagram

N

NOT TO SCALE

Drawn:	CPL	Checked:	JLS
Date:	05/09/19	Approved:	JLS
Dwg. No.:	A17073-62	**Figure 2**	

Appendix B
Detailed Emission Rate Calculations

Texas GulfLink, LLC
Facility Emissions Summary

EPN	Source	CO_2e		PM_{10}		$PM_{2.5}$		SO_2		NOx		CO		Total VOC	
		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
(P) M-1	Marine Loading													4,709.72	9,679.15
(P) G-1	Generator 1	4,856	4,406	0.32	1.39	0.32	1.39	0.01	0.05	9.92	43.45	5.57	24.40	0.27	1.16
(P) G-2	Generator 2	4,856	4,406	0.32	1.39	0.32	1.39	0.01	0.05	9.92	43.45	5.57	24.40	0.27	1.16
(P) C-1	Crane 1	485	2,132	0.14	0.61	0.14	0.61	0.01	0.02	2.59	11.32	2.45	10.71	0.21	0.92
(P) DT-1	Day Tank 1													0.001	0.01
(P) BT-1	Belly Tank 1													0.0002	0.001
(P) BT-2	Belly Tank 2													0.0002	0.001
(P) BT-3	Belly Tank 3													0.0002	0.001
(P) BT-4	Belly Tank 4													0.00002	0.0001
(P) T-1	Surge Tank													0.40	1.74
(P) FWP-1	MSS - Firewater Pump	5	20	0.12	0.01	0.12	0.01			2.12	0.11	2.01	0.10	0.18	0.01
(P) P-1	MSS - Pigging Operations													83.76	0.50
(P) F-1	Platform Fugitive Emissions													0.03	0.12
(P) F-2	SPM System Fugitives													0.10	0.44
(P) S-1	Sampling Activities													0.10	0.05
(P) PM-1	MSS - Pump Maintenance													4.00	0.002
(P) MSS-1	MSS - Abrasive Blasting / Painting			0.01	0.06	0.002	0.01							0.06	0.26
	TOTAL EMISSIONS (TPY)	**10,201**	**10,965**	**0.91**	**3.47**	**0.89**	**3.42**	**0.03**	**0.13**	**24.54**	**98.33**	**15.60**	**59.60**	**4,799.10**	**9,685.53**

EPN	Source	H_2S		Acetaldehyde		Benzene		Isopropylbenzene		Ethylbenzene		Formaldehyde		Hexane (-n)		2,2,4-Trimethylpentane		Toluene		Xylene (-m)	
		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
(P) M-1	Marine Loading	0.12	0.05			20.78	42.70	0.16	0.33	1.39	2.86			107.53	220.99	1.79	3.67	10.17	20.90	4.08	8.38
(P) G-1	Generator 1			0.0002	0.001	0.01	0.02					0.001	0.002					0.002	0.01	0.002	0.01
(P) G-2	Generator 2			0.0002	0.001	0.01	0.02					0.001	0.002					0.002	0.01	0.002	0.01
(P) C-1	Crane 1											0.004	0.02								
(P) DT-1	Day Tank 1																				
(P) BT-1	Belly Tank 1																				
(P) BT-2	Belly Tank 2																				
(P) BT-3	Belly Tank 3																				
(P) BT-4	Belly Tank 4																				
(P) T-1	Surge Tank					0.002	0.01			0.0001	0.001			0.01	0.04			0.001	0.004	0.0003	0.002
(P) FWP-1	MSS - Firewater Pump																				
(P) P-1	MSS - Pigging Operations					0.37	0.002							1.91	0.01			0.18	0.001		
(P) F-1	Platform Fugitive Emissions						0.00071							0.0005	0.002				0.00118	0.0004	0.002
(P) F-2	SPM System Fugitives																				
(P) S-1	Sampling Activities																				
(P) PM-1	MSS - Pump Maintenance																				
(P) MSS-1	MSS - Abrasive Blasting / Painting																				
	TOTAL EMISSIONS (TPY)	**0.12**	**0.05**	**0.0003**	**0.001**	**21.16**	**42.75**	**0.16**	**0.33**	**1.39**	**2.86**	**0.005**	**0.02**	**109.45**	**221.04**	**1.79**	**3.67**	**10.36**	**20.92**	**4.08**	**8.39**

Texas GulfLink, LLC
Offshore Platform
Marine Loading

EPN	Description
(P) M-1	Marine Loading

AP-42, Chapter 5, Section 5.2
Transportation and Marketing of Petroleum Liquids
Equation 2 was developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges

$C_L = C_A + C_G$
C_L = total loading loss (lb/10^3 gal of crude oil loaded)

C_A = arrival emission factor (lb/10^3 gal loaded)

C_A =	0.86	Taken from Table 5.2-3, based on "Uncleaned" and "Volatile", assumes no ballasting. Vapor pressure is > 1.5 psia.

C_G = generated emission factor (lb/10^3 gal loaded)
Equation 3: C_G = 1.84*(0.44P-0.42)*((MG)/T)

P =	8.98	psia	Average true vapor pressure for Crude Oil estimated using TANKS 4.09d and information provided by Abadie-Williams LLC	
P =	10.00	psia	Maximum true vapor pressure for Crude Oil estimated using AP-42, Figure 7.1-13 and information provided by Abadie-Williams LLC	Based on 80 deg F and RVP10.
M =	50	lb/lb-mol	VMW of loaded crude	
G =	1.02	dimensionless	AP-42	
T =	529.67	deg R	Average temperature of loaded crude provided by Abadie-Williams LLC	
T =	539.67	deg R	Maximum temperature of loaded crude provided by Abadie-Williams LLC	
C_G =	0.63	**ANNUAL EMISSION FACTOR**		
C_G =	0.69	**MAXIMUM EMISSION FACTOR**		

ANNUAL

C_L =	1.49	lb TOC/10^3 gal loaded	1.26	lb VOC/10^3 gal loaded

MAXIMUM

C_L =	1.55	lb TOC/10^3 gal loaded	1.32	lb VOC/10^3 gal loaded

Per Chapter 5, emission factors derived from Equation 3 and Table 5.2-3 represent TOC. When specific vapor composition information is not available, the VOC emission factor can be estimated by taking 85% of the TOC factor.

Pollutant	Maximum Emission Factor (lb/10^3 gal)	Annual Emission Factor (lb/10^3 gal)	Maximum Crude Loading Rate (bbl/hr)	Annual Crude Loaded (bbl/yr)	MW (lb/lbmol)	Average Concentration of H_2S in Crude (ppmv)	Maximum Concentration of H_2S in Crude (ppmv)	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
VOC	1.32	1.26	85,000	365,000,000	-	-	-	2,209.85	4,709.72	9,679.15
Benzene	-	-	-	-	-	-	-	9.75	20.78	42.70
Ethylbenzene	-	-	-	-	-	-	-	0.65	1.39	2.86
n-Hexane	-	-	-	-	-	-	-	50.45	107.53	220.99
Isooctane	-	-	-	-	-	-	-	0.84	1.79	3.67
Isopropyl benzene	-	-	-	-	-	-	-	0.07	0.16	0.33
Toluene	-	-	-	-	-	-	-	4.77	10.17	20.90
Xylene	-	-	-	-	-	-	-	1.91	4.08	8.38
H_2S	-	-	-	-	34.1	5	25	0.01	0.12	0.05

Annual Crude Loading Rate provided by Abadie-Williams LLC.
Maximum Crude Loading Rate provided by Abadie-Williams LLC.
Maximum and Annual Concentration of H_2S in Crude is an assumption.

From TANKS 4.09d:

NAME	V_WT_FRACT
Benzene	0.0044
Ethylbenzene	0.0003
Hexane (-n)	0.0228
Isooctane	0.0004
Isopropyl benzene	0.0000
Toluene	0.0022
Xylene (-m)	0.0009
Unidentified Components	0.9637
Cyclohexane	0.0053
1,2,4-Trimethylbenzene	0.0000

Texas GulfLink, LLC
Offshore Platform
Generators

Two (2) 650 KW generators are used to supply electricity to the platform.

EPN	Description
(P) G-1	Generator 1
(P) G-2	Generator 2

Given:

Power Output of Each Generator	650 KW[(1)]
Power Output of Each Engine	968 Hp
Power Output of Each Engine	722 KW[(2)]
Operation Time	8,760 hrs
Firing Rate:	6.78 MMBtu/hr[(3)]

Calculation Methodology:
Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation for One Engine:

Pollutant	Emission Factor[(4)] [g/kW-hr]	Emission Factor[(2)] [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
$PM_{2.5}$	0.2	0.15	0.0003	NSPS 4I	0.32	0.32	1.39
PM_{10}	0.2	0.15	0.0003	NSPS 4I	0.32	0.32	1.39
SO_2	-	-	0.00001	AP-42, Ch. 3.4 15 ppm	0.01	0.01	0.05
CO	3.5	2.61	0.01	NSPS 4I	5.57	5.57	24.40
NMHC + NOx	6.40	-	-	NSPS 4I	-	-	-
NO_x	6.23	4.65	0.01	NSPS 4I	9.92	9.92	43.45
Total VOC	0.17	0.12	0.0003	NSPS 4I	0.27	0.27	1.16

Greenhouse Gases Emission Calculation for One Engine:

Pollutant	Emission Factor[(5)] (kg/MMBtu)	Global Warming Potentials[(6)]	Emissions			
			Average[(7)] (lb/hr)	Maximum (lb/hr)	Annual (tpy)	CO_2e[(8)] (tonnes/yr)
CO_2	73.96	1	1,105	1,105	4,839	4,391
CH_4	3.00E-03	25	0.04	0.04	5	4
N_2O	6.00E-04	298	0.01	0.01	12	11
CO_2e	--	--	1,105	1,105	4,856	4,406

Toxic Air Pollutant Emission Calculation for One Engine:

Pollutant	Emission Factor [lb/MMBtu]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Acetaldehyde	0.0000252	AP-42, Ch. 3.4	0.0002	0.0002	0.001
Benzene	0.000776	AP-42, Ch. 3.4	0.005	0.005	0.02
Formaldehyde	0.0000789	AP-42, Ch. 3.4	0.001	0.001	0.002
Toluene	0.000281	AP-42, Ch. 3.4	0.002	0.002	0.01
Xylene	0.000193	AP-42, Ch. 3.4	0.001	0.001	0.01

Notes:
(1) Provided by Abadie-Williams LLC
(2) 1.341 hp/Kw
(3) Converted using 7,000 Btu/hp-hr from AP-42, Chapter 3.
(4) NMHC + NO_x, CO, and PM taken from 40 CFR 89.112(a) Table 1; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NO_x factor used for VOC and NOx by assuming 97% NO_x and 3% VOC, based on the ratios of NO_x and VOC AP-42 emission factors in Chapter 3.4.
(5) All emission factors taken from Tables C-1 and C-2 to Subpart C of Part 98. Distillate Fuel Oil No. 2 for CO_2 emission factor, Petroleum (all fuel type in Table C-1) for CH_4 and N_2O emission factors.
(6) Global warming potentials for converting to CO_2e taken from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.
(7) Emissions converted from kg to lbs using 2.20462 lb/kg.
(8) CO_2e tonnes calculated using 2,204 lbs/tonne and global warming potentials from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

Texas GulfLink, LLC
Offshore Platform
Portal Crane

One (1) 425 Hp portal crane is used on the platform.

EPN	Description
(P) C-1	Crane 1

Given:

Power Output of Each Engine	316.93	KW[1]
Power Output of Each Engine	425.00	Hp[2]
Operation Time	8,760	hrs
Firing Rate:	2.98	MMBtu/hr[3]

Calculation Methodology:
Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation for One Engine:

Pollutant	Emission Factor[4] [g/kW-hr]	Emission Factor[2] [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
$PM_{2.5}$	0.2	0.15	0.0003	NSPS 4I	0.14	0.14	0.61
PM_{10}	0.2	0.15	0.0003	NSPS 4I	0.14	0.14	0.61
SO_2	-	-	0.00001	AP-42, Ch. 3.4 15 ppm	0.01	0.01	0.02
CO	3.5	2.61	0.01	NSPS 4I	2.45	2.45	10.71
NMHC + NOx	4.00	-	-	NSPS 4I	-	-	-
NO_x	3.70	2.76	0.01	NSPS 4I	2.59	2.59	11.32
Total VOC	0.30	0.22	0.0005	NSPS 4I	0.21	0.21	0.92

Greenhouse Gases Emission Calculation for One Engine:

Pollutant	Emission Factor[5] (kg/MMBtu)	Global Warming Potentials[6]	Emissions			
			Average[7] (lb/hr)	Maximum (lb/hr)	Annual (tpy)	CO_2e[8] (tonnes/yr)
CO_2	73.96	1	485.08	485.08	2124.67	1928.01
CH_4	3.00E-03	25	0.02	0.02	2.15	1.96
N_2O	6.00E-04	298	0.004	0.004	5.14	4.66
CO_2e	--	--	485.11	485.11	2131.96	1934.63

Toxic Air Pollutant Emission Calculation for One Engine:

Pollutant	Emission Factor [lb/MMBtu]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Formaldehyde	0.00118	AP-42, Ch. 3.3	0.004	0.004	0.02

Notes:
(1) Calculated using 1.341 hp/kW.
(2) Provided by Abadie-Williams LLC
(3) Converted using 7,000 Btu/hp-hr from AP-42, Chapter 3.
(4) NMHC + NOx, CO, and PM taken from 40 CFR 89.112(a) Table 1; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NOx factor used for VOC and NOx by assuming 92% NOx and 8% VOC, based on the ratios of NOx and VOC AP-42 emission factors in Chapter 3.4. Assumes Tier III.
(5) All emission factors taken from Tables C-1 and C-2 to Subpart C of Part 98. Distillate Fuel Oil No. 2 for CO_2 emission factor, Petroleum (all fuel type in Table C-1) for CH_4 and N_2O emission factors.
(6) Global warming potentials for converting to CO_2e taken from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.
(7) Emissions converted from kg to lbs using 2.20462 lb/kg.
(8) CO_2e tonnes calculated using 2,204 lbs/tonne and global warming potentials from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

Texas GulfLink, LLC
Offshore Platform
Diesel Fuel Tank for Engines

Tank Data:

EPN	Description	Tank Type	Stored Product	Annual Operating Hours	Volume (gal)	Annual Throughput (gal/yr)
(P) DT-1	Day Tank 1	Vertical Fixed Roof	Diesel	8,760	20,000	300,000

Calculation Methodology:
Note: Emissions are based on AP-42, Chapter 7, November 2006.
Average Hourly Rate [lb/hr] = TANKS Emission Report (lb/yr) / 8760 hrs/yr
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = TANKS Emission Report (lb/yr) / 2000 lb/ton

Emission Calculation for One Tank:

Pollutant	VOC Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	11.04	0.001	0.001	0.01
Benzene	0.02	2.E-06	2.E-06	1.E-05
Ethylbenzene	0.04	4.E-06	4.E-06	2.E-05
n-Hexane	0.00	5.E-07	5.E-07	2.E-06
Toluene	0.25	0.00003	0.00003	0.0001
Xylenes	0.66	0.0001	0.0001	0.0003

Texas GulfLink, LLC
Offshore Platform
Diesel Fuel Tanks for Engines (Generators, Crane, Firewater Pump)

Tank Data:

EPN	Description	Tank Type	Stored Product	Annual Operating Hours	Volume (gal)	Annual Throughput (gal/yr)
(P) BT-1	Belly Tank 1	Horizontal Fixed Roof	Diesel	8,760	1,000	99,667
(P) BT-2	Belly Tank 2	Horizontal Fixed Roof	Diesel	8,760	1,000	99,667
(P) BT-3	Belly Tank 3	Horizontal Fixed Roof	Diesel	8,760	1,000	99,667
(P) BT-4	Belly Tank 4	Horizontal Fixed Roof	Diesel	8,760	1,000	1,000

Calculation Methodology:
Note: Emissions are based on AP-42, Chapter 7, November 2006.
Average Hourly Rate [lb/hr] = TANKS Emission Report (lb/yr) / 8760 hrs/yr
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = TANKS Emission Report (lb/yr) / 2000 lb/ton

Emission Summary for one Belly Tank (BT-1, BT-2, BT-3):

Pollutant	Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	1.50	0.0002	0.0002	0.001
Benzene	0.003	3.E-07	3.E-07	1.E-06
Ethylbenzene	0.005	5.E-07	5.E-07	2.E-06
n-Hexane	0.001	7.E-08	7.E-08	3.E-07
Toluene	0.03	4.E-06	4.E-06	2.E-05
Xylenes	0.09	1.E-05	1.E-05	4.E-05

Emission Summary for one Belly Tank (BT-4):

Pollutant	Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	0.16	0.00002	0.00002	0.0001
Benzene	0.0003	4.E-08	4.E-08	2.E-07
Ethylbenzene	0.001	6.E-08	6.E-08	3.E-07
n-Hexane	0.0001	7.E-09	7.E-09	3.E-08
Toluene	0.004	4.E-07	4.E-07	2.E-06
Xylenes	0.01	1.E-06	1.E-06	5.E-06

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	(P) BT-1, (P) BT-2, (P) BT-3
City:	Freeport
State:	Texas
Company:	Sentinel Midstream
Type of Tank:	Horizontal Tank
Description:	Belly Tank for Generators and Crane, emissions represent one tank.

Tank Dimensions

Shell Length (ft):	10.00
Diameter (ft):	4.00
Volume (gallons):	1,000.00
Turnovers:	99.67
Net Throughput(gal/yr):	99,666.67
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

(P) BT-1, (P) BT-2, (P) BT-3 - Horizontal Tank
Freeport, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	71.54	68.18	74.90	69.66	0.0095	0.0085	0.0105	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
1,2,4-Trimethylbenzene						0.0320	0.0282	0.0363	120.1900	0.0100	0.0490	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5948	1.4590	1.7409	78.1100	0.0000	0.0020	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.1604	0.1435	0.1790	106.1700	0.0001	0.0032	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5633	2.3578	2.7832	86.1700	0.0000	0.0004	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4684	0.4239	0.5168	92.1300	0.0003	0.0229	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.0081	0.0074	0.0079	134.5138	0.9866	0.8632	189.60	
Xylene (-m)						0.1341	0.1198	0.1498	106.1700	0.0029	0.0594	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

(P) BT-1, (P) BT-2, (P) BT-3 - Horizontal Tank
Freeport, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	0.1344
Vapor Space Volume (cu ft):	80.0406
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0213
Vented Vapor Saturation Factor:	0.9990
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	80.0406
Tank Diameter (ft):	4.0000
Effective Diameter (ft):	7.1383
Vapor Space Outage (ft):	2.0000
Tank Shell Length (ft):	10.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0213
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.0019
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0085
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0105
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9990
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0095
Vapor Space Outage (ft):	2.0000
Working Losses (lb):	1.3650
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Annual Net Throughput (gal/yr.):	99,666.6667
Annual Turnovers:	99.6667
Turnover Factor:	0.4677

Tank Diameter (ft):	4.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1.4995

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

(P) BT-1, (P) BT-2, (P) BT-3 - Horizontal Tank
Freeport, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Hexane (-n)	0.00	0.00	0.00
Benzene	0.00	0.00	0.00
Toluene	0.03	0.00	0.03
Ethylbenzene	0.00	0.00	0.00
Xylene (-m)	0.08	0.01	0.09
1,2,4-Trimethylbenzene	0.07	0.01	0.07
Unidentified Components	1.18	0.12	1.29
Distillate fuel oil no. 2	1.37	0.13	1.50

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	(P) BT-4
City:	Freeport
State:	Texas
Company:	Sentinel Midstream
Type of Tank:	Horizontal Tank
Description:	Belly Tank for Firewater Pump
Tank Dimensions	
Shell Length (ft):	10.00
Diameter (ft):	4.00
Volume (gallons):	1,000.00
Turnovers:	1.00
Net Throughput(gal/yr):	1,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

(P) BT-4 - Horizontal Tank
Freeport, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	71.54	68.18	74.90	69.66	0.0095	0.0085	0.0105	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
1,2,4-Trimethylbenzene						0.0320	0.0282	0.0363	120.1900	0.0100	0.0490	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5948	1.4590	1.7409	78.1100	0.0000	0.0020	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.1604	0.1435	0.1790	106.1700	0.0001	0.0032	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5633	2.3578	2.7832	86.1700	0.0000	0.0004	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4684	0.4239	0.5168	92.1300	0.0003	0.0229	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.0081	0.0074	0.0079	134.5138	0.9866	0.8632	189.60	
Xylene (-m)						0.1341	0.1198	0.1498	106.1700	0.0029	0.0594	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

(P) BT-4 - Horizontal Tank
Freeport, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	0.1344
Vapor Space Volume (cu ft):	80.0406
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0213
Vented Vapor Saturation Factor:	0.9990
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	80.0406
Tank Diameter (ft):	4.0000
Effective Diameter (ft):	7.1383
Vapor Space Outage (ft):	2.0000
Tank Shell Length (ft):	10.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0213
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.0019
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0085
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0105
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9990
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0095
Vapor Space Outage (ft):	2.0000
Working Losses (lb):	0.0293
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Annual Net Throughput (gal/yr.):	1,000.0000
Annual Turnovers:	1.0000
Turnover Factor:	1.0000

Tank Diameter (ft):	4.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	0.1637

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

(P) BT-4 - Horizontal Tank
Freeport, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.03	0.13	0.16
Hexane (-n)	0.00	0.00	0.00
Benzene	0.00	0.00	0.00
Toluene	0.00	0.00	0.00
Ethylbenzene	0.00	0.00	0.00
Xylene (-m)	0.00	0.01	0.01
1,2,4-Trimethylbenzene	0.00	0.01	0.01
Unidentified Components	0.03	0.12	0.14

Texas GulfLink, LLC
Offshore Platform
Surge Tank

Tank Data:

EPN	Description	Tank Type	Stored Product	MW of Crude (lb/lbmol)	Average TVP of Crude (psia)	Annual Operating Hours	Volume (gal)	Annual Throughput (gal/yr)
(P) T-1	Surge Tank	Fixed Roof	Crude oil (RVP 10)	50	8.98	8,760	84,000	84,000

Volume and throughput provided by Abadie-Williams LLC.

Calculation Methodology:
Note: Emissions are based on AP-42, Chapter 7, November 2006.
Average Hourly Rate [lb/hr] = TANKS Emission Report (lb/yr) / 8760 hrs/yr
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = TANKS Emission Report (lb/yr) / 2000 lb/ton

Emission Calculation for One Tank:

Pollutant	VOC Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	3,489.80	0.40	0.40	1.74
2,2,4-Trimethylpentane (isooctane)	0.00	0E+00	0E+00	0E+00
Benzene	15.39	0.002	0.002	0.01
Ethylbenzene	1.03	0.0001	0.0001	0.001
Hexane (-n)	79.68	0.009	0.009	0.04
Isopropyl benzene	0.12	0.00001	0.00001	0.0001
Toluene	7.54	0.001	0.001	0.004
Xylene (-m)	3.02	0.0003	0.0003	0.002

Hydrogen Sulfide Emissions:

Molecular Weight of H_2S (lb/lbmol): 34.1
Average Concentration of H_2S in Crude (ppmv): 5
Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	2.E-06	2.E-06	1.E-05

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	(P) T-1 Fixed	
City:	Galveston	
State:	Texas	
Company:	Sentinel Midstream	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	Surge Tank	
Tank Dimensions		
Shell Height (ft):		40.00
Diameter (ft):		19.00
Liquid Height (ft) :		40.00
Avg. Liquid Height (ft):		20.00
Volume (gallons):		84,000.00
Turnovers:		1.00
Net Throughput(gal/yr):		84,000.00
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		0.00
Slope (ft/ft) (Cone Roof)		0.06
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 10)	All	71.54	68.18	74.90	69.66	8.9800	8.5126	9.4668	50.0000			207.00	Option 4: RVP=10
1,2,4-Trimethylbenzene						0.0320	0.0282	0.0363	120.1900	0.0033	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5948	1.4590	1.7409	78.1100	0.0060	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.6424	1.5056	1.7893	84.1600	0.0070	0.0053	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1604	0.1435	0.1790	106.1700	0.0040	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5633	2.3578	2.7832	86.1700	0.0193	0.0228	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane									114.2200	0.0010	0.0000	114.22	
Isopropyl benzene						0.0732	0.0650	0.0824	120.2000	0.0010	0.0000	120.20	Option 2: A=6.93666, B=1460.793, C=207.78
Toluene						0.4684	0.4239	0.5168	92.1300	0.0100	0.0022	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						10.2985	10.2485	10.2788	49.2353	0.9344	0.9641	226.57	
Xylene (-m)						0.1341	0.1198	0.1498	106.1700	0.0140	0.0009	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	2,816.2932
Vapor Space Volume (cu ft):	5,726.6898
Vapor Density (lb/cu ft):	0.0788
Vapor Space Expansion Factor:	0.1815
Vented Vapor Saturation Factor:	0.0942
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	5,726.6898
Tank Diameter (ft):	19.0000
Vapor Space Outage (ft):	20.1979
Tank Shell Height (ft):	40.0000
Average Liquid Height (ft):	20.0000
Roof Outage (ft):	0.1979
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.1979
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	9.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0788
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	8.9800
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1815
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.9542
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	8.9800
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	8.5126
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	9.4668
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.0942
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	8.9800
Vapor Space Outage (ft):	20.1979

Working Losses (lb):	673.5023
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	8.9800
Annual Net Throughput (gal/yr.):	84,000.0000
Annual Turnovers:	1.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	84,000.0000
Maximum Liquid Height (ft):	40.0000
Tank Diameter (ft):	19.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	3,489.7956

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 10)	673.50	2,816.29	3,489.80
Hexane (-n)	15.38	64.30	79.68
Benzene	2.97	12.42	15.39
Isooctane	0.00	0.00	0.00
Toluene	1.45	6.08	7.54
Ethylbenzene	0.20	0.83	1.03
Xylene (-m)	0.58	2.44	3.02
Isopropyl benzene	0.02	0.10	0.12
1,2,4-Trimethylbenzene	0.03	0.14	0.17
Cyclohexane	3.57	14.93	18.50
Unidentified Components	649.29	2,715.06	3,364.35

Texas GulfLink, LLC
Offshore Platform
Firewater Pump

Engine Data

EPN	Description	Fuel Type	Brake Hp	Annual Operating Hours	Specific Fuel Consumption (Btu/hp-hr)[a]	Heat Input (MMBtu/hr)[b]	Annual Heat Rate (MMBtu/yr)[c]
(P) FWP-1	MSS - Firewater Pump	Diesel	350	100	7,000	2.45	245

[a] Given that specific data is unavailable for this engine, this calculation uses the average brake-specific fuel consumption from AP-42 Table 3.3-1, Footnote a
[b] calculated; (Btu/hp-hr * hp) / 1,000,000
[c] calculated; MMBtu/hr * hr/yr

Calculation Methodology:
Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation:

Pollutant	Emission Factor[d] [g/kW-hr]	Emission Factor[e] [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Firewater Pump Engine - (P) FWP-1							
$PM_{2.5}$	0.2	0.15	0.0003	NSPS 4I	0.12	0.12	0.01
PM_{10}	0.2	0.15	0.0003	NSPS 4I	0.12	0.12	0.01
SO_2	-	-	0.00001	AP-42, Ch. 3.4 15 ppm	0.004	0.004	0.0002
CO	3.5	2.61	0.01	NSPS 4I	2.01	2.01	0.10
NMHC + NOx	4	-	-	NSPS 4I	-	-	-
NO_x	3.7	2.74	0.01	NSPS 4I	2.12	2.12	0.11
Total VOC	0.3	0.24	0.001	NSPS 4I	0.18	0.18	0.01

[d] **350 Hp Firewater Pump Engine:**
NMHC + NOx, CO, and PM taken from 40 CFR 60, Subpart IIII, Table 4 [225<=kW<450 (300<=Hp<600)]; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NO_x factor used for VOC and NO_x by assuming 92% NO_x and 8% VOC, based on the ratios of NO_x and VOC AP-42 emission factors.
[e] 1 kW = 1.341 hp

Greenhouse Gas Emission Factors

Pollutant	Global Warming Potential[f]	Emission Factor[g] (kg/MMBtu)
CO_2	1	73.96
CH_4	25	3.0E-03
N_2O	298	6.0E-04
CO_2e	-	-

[f] Default global warming potentials from 40 CFR 98 Subpart A, Table A-1.

[g] Default emission factors from 40 CFR 98 Subpart C, Tables C-1 and C-2, for diesel.

Greenhouse Gas Emissions Summary

EPN	CO_2			CH_4			N_2O			CO_2e		
	(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(metric tpy)[h]	(short tpy)[i]	(lb/hr)
(P) FWP-1	18	20	399	0.02	0.02	0.4	0.04	0.05	1	18	20	401

[h] Calculated by using 40 CFR 98 Subpart C Equation C-1b.

[i] Calculated by multiplying metric tons per year by 1.10231 short tons/metric ton, as per 40 CFR 98 Subpart A, Table A-2.

Texas GulfLink, LLC
Offshore Platform
Pigging Operations

EPN	Description
(P) P-1	MSS - Pigging Operations

The chambers for the inlet gas and residue gas receivers were estimated as shown below.

	Gas Line Receiver	
Receiver diameter	54	in
Receiver length	38	ft
Pipeline Pressure	1	psig
Receiver volume	604.36	cu ft
Gas volume	645.48	SCF
Duration of releases	0.50	hr
Releases per year	12	# per yr
VMW of Crude from TANKS 4.09d:	50.00	lb/lbmol
	385.30	scf/lbmol
	1.68	lbmol
	83.76	lbs VOC per event
	1,005.16	lbs VOC per year

From TANKS 4.09d:

NAME	V_WT_FRACT
Hexane (-n)	0.022831039
Benzene	0.004411371
Isooctane	0.000379612
Toluene	0.002159389
Ethylbenzene	0.00029583
Xylene (-m)	0.000865592
Isopropyl benzene	3.37653E-05

0.50	tons VOC per year
0.01147	tons/yr n-Hexane
0.00222	tons/yr Benzene
0.00019	tons/yr Isooctane
0.00109	tons/yr Toluene
0.00015	tons/yr Ethylbenzene
0.00044	tons/yr Xylene
0.00002	tons/yr Cumene
83.76	lbs VOC per hr
1.91	lbs/hr n-Hexane
0.37	lbs/hr Benzene
0.03	lbs/hr Isooctane
0.18	lbs/hr Toluene
0.02	lbs/hr Ethylbenzene
0.07	lbs/hr Xylene
0.003	lbs/hr Cumene

Hydrogen Sulfide Emissions:

Molecular Weight of H2S (lb/lbmol):	34.1
Average Concentration of H_2S in Crude (ppmv):	5
Molecular Weight of Crude (lb/lbmol):	50
Average TVP of Crude (psia):	8.98

Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	6.41E-07	6.41E-07	2.81E-06

Texas GulfLink, LLC
Offshore Platform
Platform Fugitive Emissions

EPN	Description
(P) F-1	Platform Fugitive Emissions

Given:

Component Type	Service	Component Count
valves	Light liquid (LL)	163
pump seals	Light liquid (LL)	4
flanges	Light liquid (LL)	378

The number of flanges is assumed to be twice that of valves.

Calculation Methodology:
VOC Average Hourly Rate [lb/hr] = TCEQ Emission Factor [lb/hr/component] x Component Count
VOC TAP Speciate Hourly Rate [lb/hr] = Liquid Mass Fraction x Total VOC Average Hourly Rate [lb/hr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Average Hourly Rate [lb/hr] / Conversion Factor [2000 lb/ton] x Annual Operating Hours

Reference:
Air Permit Technical Guidance for Chemical Sources - Fugitive Guidance, APDG 6422, Air Permits Division TCEQ, June 2018, Table II

Emission Calculation:

Component Type	Light Liquid Emission Factor [lb/hr/component]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
valves	0.0000948	0.02	0.02	0.07
pump seals	0.00119	0.005	0.005	0.02
flanges	0.00001762	0.01	0.01	0.03
	Total VOC	**0.03**	**0.03**	**0.12**

VOC TAP Speciation	Liquid Mass Fraction[(1)]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Benzene	0.006	0.0002	0.0002	0.0007
Ethylbenzene	0.004	0.00011	0.00011	0.0005
n-Hexane	0.019	0.00052	0.00052	0.0023
Toluene	0.010	0.0003	0.0003	0.0012
Xylenes	0.014	0.0004	0.0004	0.002
Cumene (Isopropyl benzene)	0.001	0.00003	0.00003	0.00012
Iso-octane	0.001	0.00003	0.00003	0.00012

Notes:
(1) VOC TAP Speciation Profile from TANKS 4.09d for Crude Oil.

Hydrogen Sulfide Emissions:

Molecular Weight of H2S (lb/lbmol): 34.1
Average Concentration of H_2S in Crude (ppmv): 5
Molecular Weight of Crude (lb/lbmol): 50
Average TVP of Crude (psia): 8.98
Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	1.50E-07	1.50E-07	6.57E-07

Texas GulfLink, LLC
Offshore Platform
SPM System Fugitives

EPN	Description
(P) F-2	SPM System Fugitives

Maximum w/ Contingency (days per year) 365 days
24 hr/day

Emission Calculations

Component Type	Total Number of Components [1]	Oil & Gas Emission Factor (lb/hr)	Fugitive Emission Factor [2] (lb/hr/component)	Total Organic Compound Average lbs/hr	Total Organic Compound Maximum lbs/hr	Total Organic Compound lbs/day	Total Organic Compound tons/project
Valves	16	Light Liquid (Light Oil> 20° API)	5.50E-03	8.80E-02	8.80E-02	2.11	0.39
Flanges	52	Light Liquid (Light Oil> 20° API)	2.43E-04	1.26E-02	1.26E-02	0.30	0.06
	Total TOC [4] - Heavy Oil Streams			**0.10**	**0.10**	**2.42**	**0.44**

[1] Component counts are based on engineering design information provided by Abadie-Williams LLC.
[2] Emission Factors were obtained from *Table 4. Average Emission Factors - Petroleum Industry* (Oil & Gas Production Operations) of TCEQ's Addendum to RG-360A, Emission Factors for Equipment Leak Fugitives Components, January 2008.
[3] Fugitive emissions are conservatively estimated to be 100% VOC.
[4] Annual operating hours are conservatively assumed to be 8,760 hours per year.

Texas GulfLink, LLC
Offshore Platform
Miscellaneous Emissions

EPN	Description
(P) S-1	Sampling Activities
(P) PM-1	MSS - Pump Maintenance

Sampling Activities

Emissions from sampling activities are estimated based on the following:

Quantity	Units
1	sample/shift
3	shifts/day
0.1	lb VOC/sample
0.1	lb VOC/hr
0.05	ton VOC/yr

MSS - Pump Maintenance

Emissions from pump maintenance are estimated based on the following:

Quantity	Units
4	pumps
1	maintenance event/yr
1	lb/maintenance event
4	lb VOC/hr
0.002	ton VOC/yr

MSS Emissions Associated with Abrasive Blasting and Painting

Company Name	Texas GulfLink, LLC
Site Name	Offshore Platform

Source Name	MSS - Abrasive Blasting / Painting
EPN	(P) MSS-1

1. Input variables such as amount of paint used (gallons) or number of hours blasting operation occurs in the yellow box. 2. Default numbers are included for your convenience but may be edited

#	Activity	Description / comments	Default parameters		Input parameters		Annual emissions (tpy)
1	***(b)(2) Aerosol Cans*** Includes spray paints and primers, degreasers, cleaners and other solvents, rust inhibitors	- 90% VOC content is an average obtained from a survey of MSDS sheets (c)(d)(e) for spray paints and primers, degreasers, cleaners and other solvents, rust inhibitors. This does not include lubricants. -VOC is propellant. 100% VOC evaporates.	Standard Industrial Size Cans (oz.)	16	Number of 16 oz cans used	100	0.045 VOC (tpy)
			VOC emissions (lb/can)	0.9			
2	***(b)(2) Manual application of paints, primer*** Touch up paint	-100% VOC evaporates - Survey of MSDS sheets (a) (b) indicates VOC content varies from 2 lb/gallon to 7 lb/gallon. As Chapter 115 limits VOC content to 3.5 lb/gal in nonattainment areas this was used as a conservative amount -Usage of paint based on technical expertise and NSR permit section reviews.	VOC content (lb/gal)	3.5	Paint used (gallons)	25	0.044 VOC (tpy)
3	***(b)(2) Painting Tanks and Other Immovable Fixed Structures*** Spray Painting	-100% VOC evaporates -Painting used on 1 tank or 1 vessel per year - Survey of MSDS sheets (a)(b) indicates VOC content varies from 2 lb/gallon to 7 lb/gallon. As Chapter 115 limits VOC content to 3.5 lb/gal in nonattainment areas this was used as a conservative amount. -Input parameters based on TCEQ Surface Coating Guidance Document for Air Quality Permit Applications. -Per field research in 2012, company indicated that a large site uses around 100 gallons to paint pipes and tanks in 6 month period.	VOC content (lb/gal)	3.5	Paint used (gallons)	100	0.175 VOC (tpy)
			$PM_{10\ \&\ 2.5}$ content (lb/gal)	8			
			Transfer Efficiency $PM_{10\ \&\ 2.5}$ (%)	65			0.008 PM_{10} (tpy)
			Droplet factor for $PM_{2.5}$ overspray (%)	99			
			Droplet factor for PM_{10} overspray (%)	94			0.001 $PM_{2.5}$ (tpy)
4	***(b)(2) Sandblasting***	-An application rate of 2,000 lb/hr. -Per industry expertise and BMP, blasting occurs for 5 days per year and 8 hrs per day -Emission factors for PM10 based on TCEQ Abrasive Blast Cleaning technical guidance document. Emission factor for PM2.5 is based on 15% of PM10 emission factor.	Emission factor for PM_{10} (lb/lb of usage)	0.0014	Number of hours blasting operation occurs	40	0.056 PM_{10} (tpy)
			Application rate (lb/hr)	2000			
			PM_{10} Emissions (lb/hr)	2.8			
			Emission factor for $PM_{2.5}$ (lb/lb of usage)	0.00021			0.0084 $PM_{2.5}$ (tpy)
			Application rate (lb/hr)	2000			
			$PM_{2.5}$ Emissions (lb/hr)	0.42			

	TPY	lbs/hr
Total VOC emissions	**0.26**	**0.06**
Total PM_{10} emissions	**0.06**	**0.01**
Total $PM_{2.5}$ emissions	**0.01**	**0.002**

Appendix C
RBLC Search Results

TABLE C1 - RBLC VOC DATA SEARCH FOR REFINING LOADINGS (SECTION 50.004)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
LA-0213	ST. CHARLES REFINERY	CRU: CHLOROSORB VENT AND DUST COLLECTOR	50.003				COMPLY WITH 40 CFR 63 SUBPART UUU	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	FLARE 1-5 (15-77, 12-81, 2004-5A, 2004-5B & 2005-38)	50.008				COMPLY WITH 40 CFR 63 SUBPART A	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	SRU THERMAL OXIDIZERS (99-3, 99-4, 2005-39, 2007-4)	50.006		50	MMBTU/H	PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0.34	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	PETROLEUM PRODUCT LOADING DOCKS (94-9)	50.004				COMPLY WITH LAC 33:III.2108 FOR LOADING MATERIALS WITH VAPOR PRESSURE > 1.5 PSIA	687	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	MVR THERMAL OXIDIZER NO. 1 (94-8)	50.008		240	MMBTU/H	COMPLY WITH LAC 33:III.2108 AND 40 CFR 63 SUBPART CC	442	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	MVR THERMAL OXIDIZER NO. 2 (2008-38)	50.008	REFINERY FUEL GAS	200	MMBTU/H	COMPLY WITH 40 CFR 61 SUBPART BB	5.4	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	LOADINGS - REFINERY	50.004				TRUCK/RAILCAR LOADING: COMPLY WITH 40 CFR 63 SUBPART CC	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	LOADINGS - AROMATIC RECOVERY UNIT	64.005				RAILCAR LOADING: COMPLY WITH 40 CFR 63 SUBPART G MARINE LOADING: COMPLY WITH 40 CFR 61 SUBPART BB	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	THERMAL OXIDIZERS (2008-32, 2008-33, 2008-34)	50.008	PROCESS FUEL GAS	15	MMBTU/H EA	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0		BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 1 or 2 Marine Vapor Recovery Loading (406-D-15, EQT 75)	50.004		630000	GALS/HR	FLARE	0.071	LB/1000 GALS	BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 1 or 2 Marine Vapor Recovery Loading (406-D-16, EQT 76)	50.004		630000	GALS/HR	FLARE	0.071	LB/1000 GALS	BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 1 Non-MVR Loading (406-1, EQT 77)	50.004		630000	GALS/HR		0.206	LB/1000 GALS	BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 3 Non-MVR Loading (406-3, EQT 198)	50.004		630000	GALS/HR		0.206	LB/1000 GALS	BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 2 Non-MVR Loading (406-2, EQT 78)	50.004		630000	GALS/HR		0.206	LB/1000 GALS	BACT-PSD
LA-0316	CAMERON LNG FACILITY	thermal oxidizers (4 units)	19.2	natural gas	390.42	mm btu/hr	good equipment design, proper operating practices, and fueled by natural gas	0		BACT-PSD
LA-0316	CAMERON LNG FACILITY	Flares (3 units)	19.39	natural gas	0		proper plant operations and maintaining the presence of the flame at the flare tips when vent gas is routed to the flares	0		BACT-PSD
LA-0316	CAMERON LNG FACILITY	condensate loading	50.004		604240	bbls/yr	good equipment design and proper operating practices; vapor balanced loading	0		BACT-PSD
TX-0812	CRUDE OIL PROCESSING FACILITY	Petroleum Liquid Storage in Floating Roof tanks	42.006		0		Internal floating roof. Integrity of the floating roof seal must be verified through periodic visual inspections and seal gap measurements. The tank must be constructed with a drain dry sump, and an available connection to a control device.	3.04	T/YR	BACT-PSD

TABLE C1 - RBLC VOC DATA SEARCH FOR REFINING LOADINGS (SECTION 50.004)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
TX-0812	CRUDE OIL PROCESSING FACILITY	Petroleum Refining Separation Processes	50.005		35000	BBL/DAY	Continuous flaring of distillation unit overheads must be discontinued following start of operation of the condensate splitter (including gas plant). All process vents or pressure relief devices (including steam ejectors and intermittent process vents) must be directed to a flare meeting 40 CFR Â§60.18 requirements.	0		BACT-PSD
TX-0812	CRUDE OIL PROCESSING FACILITY	Refinery Flares	19.33		0		The flare must conform to 40 CFR Â§ 60.18 requirements. Vent stream composition and flow must be continuously monitored to demonstrate compliance.	0		BACT-PSD
TX-0812	CRUDE OIL PROCESSING FACILITY	Transfer Operations	50.004		80	MM BBL / YR	If the product loaded has a VOC vapor pressure in excess of 0.50 psia, all displaced loading vapors must be captured and directed to a vapor combustor with a destruction/removal efficiency (DRE) of 99.5% or greater. For non-inerted ships (inland barges), capture system integrity is ensured by loading under vacuum. For inerted vessels (oceangoing tankers and barges), the ship must possess a recent vapor tightness certification prior to start of loading.	0		BACT-PSD
OH-0308	SUN COMPANY, INC., TOLEDO REFINERY	FLARE, STEAM ASSISTED	50.008	PROCESS GASES	155.44	MMBTU/H	FLARE IS CONTROL FOR HYDROCARBONS	0.84	LB/H	MACT
OH-0308	SUN COMPANY, INC., TOLEDO REFINERY	PROPYLENE-PROPANE LOADING RACK	50.004	PROPANE/PROPYLENE	34224600	GAL/YR	PRESSURIZED LOADING	1.6	T/YR	N/A

TABLE C2 - RBLC VOC DATA SEARCH FOR VOLATILE ORGANIC LIQUID STORAGE (SECTION 42.009)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
TX-0840	CORPUS CHRISTI TERMINAL	Heavy oil storage	42.005		0		1 fixed roof tank has storage of heavy oil (EPN: T-1334) with VP < 0.5 psia, painted white and equipped with submerged fill pipe.	0		BACT-PSD
TX-0850	CORPUS CHRISTI TERMINAL	Crude and condensate storage in nine IFR	42.009		0		100 series tanks storing crude / condensate (EPNs: S-100-101 through S-100-109). These tanks will be authorized to store crude oil and condensate with a VP > 0.5 psia and with capacities > 25,000 gallons. Each of the tanks is equipped with an internal floating roof and is equipped with either a mechanical shoe or double vapor mounted seal. 6 EFR tanks storing crude / condensate (EPNs: S-200M4, S-200M5, S-200M6, S-200M7, S-200M8 and S-200M9) These tanks will be equipped with welded deck seams since the tank will store products with VOC vapor pressure of 0.5 psia or greater. Proper fitting and seal integrity for the floating roof is ensured through visual inspections and any seal gap measurements specified in 40 CFR Â§ 60.113b.	0		BACT-PSD
LA-0272	AMMONIA PRODUCTION FACILITY	FRONT END PROCESS FLARE (2203-B)	19.31		0		COMPLY WITH THE MINIMUM HEAT CONTENT AND MAXIMUM TIP VELOCITY PROVISIONS OF 40 CFR 63 SUBPART A OR ADHERE TO THE REQUIREMENTS OF 40 CFR 63.11(B)(6)(i); OPERATE FLARE AT ALL TIMES EMISSIONS ARE BEING VENTED TO IT; OPERATE WITH FLAME PRESENT AT ALL TIMES.	0.01	LB/H	BACT-PSD
LA-0272	AMMONIA PRODUCTION FACILITY	BACK END PROCESS FLARE (2204-B)	19.31		0		COMPLY WITH THE MINIMUM HEAT CONTENT AND MAXIMUM TIP VELOCITY PROVISIONS OF 40 CFR 63 SUBPART A OR ADHERE TO THE REQUIREMENTS OF 40 CFR 63.11(B)(6)(i); OPERATE FLARE AT ALL TIMES EMISSIONS ARE BEING VENTED TO IT; OPERATE WITH FLAME PRESENT AT ALL TIMES.	0.01	LB/H	BACT-PSD
OK-0156	NORTHSTAR AGRI IND ENID	Crude Meal Emissions	70.39		2500	Tons per day	Desolventizer/Toaster Operation	157	DEGREES F	BACT-PSD
AR-0124	EL DORADO SAWMILL	ELEVEN OIL STORAGE TANKS SN-14	42.009		0		ENCLOSED TANKS, TANKS ARE LIGHT COLOR	0.3	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	TANKS - FOR HEAVY MATERIALS	42.005				EQUIPPED WITH FIXED ROOF AND COMPLY WITH 40 CFR 63 SUBPART CC	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	TANKS - FOR BENZENE, XYLENE, SULFOLANE, PAREX, INTERMEDIATE	42.009				EQUIPPED WITH INTERNAL FLOATING ROOFS FOLLOWED BY THERMAL OXIDIZERS	0		BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	TURBINE LUBE OIL STORAGE TANKS	42.009		6800	GALLONS EACH	GOOD COMBUSTION PRACTICE AND FUEL SPECIFICATION	0		BACT-PSD
LA-0272	AMMONIA PRODUCTION FACILITY	CO2 STRIPPER VENT (102-E)	62.999		115.83	TONS/HR	GOOD COMBUSTION PRACTICES	21.78	LB/H	BACT-PSD
*LA-0312	ST. JAMES METHANOL PLANT	RV-13 - Reformer Vent (EQT0001)	50.003	Natural Gas	3148	MM BTU/hr	Good Combustion Practices	16.97	LB/HR	BACT-PSD
TX-0663	JACKSON COUNTY GAS PLANT	Heaters	13.31	Natural Gas	17	MMBTU/H	Good combustion practices	0		BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	VEHICLE DIESEL TANK	42.005		650	GALLONS	GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION	0		BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	EMERGENCY GENERATOR ULSD TANK	42.005		300	GALLONS	GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION	0		BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	EMERGENCY GENERATOR ULSD TANKS	42.005		550	GALLONS EACH	GOOD DESIGN AND OPERATING PRACTICES	0		BACT-PSD

TABLE C2 - RBLC VOC DATA SEARCH FOR VOLATILE ORGANIC LIQUID STORAGE (SECTION 42.009)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
IA-0106	CF INDUSTRIES NITROGEN, LLC - PORT NEAL NITROGEN COMPLEX	Flares	61.012	natural gas	0		good operating practices and use of natural gas	0		BACT-PSD
TX-0656	GAS TO GASOLINE PLANT	METHANOL AND WATER STORAGE TANK	42.009		3087	GAL	HORIZONTAL FIXED ROOF WITH SUBMERGED FILL, WHITE EXTERIOR	0.12	T/YR	BACT-PSD
TX-0840	CORPUS CHRISTI TERMINAL	Crude and condensate storage	42.009		30000	BBL/H	IFR TANKS: 9 tanks (EPNs: TK-100-101 through TK-100-109) to store crude oil and condensate with a VP > 0.5 psia and with capacities > 25,000 gallons. Each of the tanks is equipped with an internal floating roof and is equipped with either a mechanical shoe or double vapor mounted seal.	0		BACT-PSD
LA-0276	BATON ROUGE JUNCTION FACILITY	Tank 190 (EQT0036 - IFR)	42.006		0		Internal floating roof and submerged fill pipe	0		BACT-PSD
MS-0092	EMBERCLEAR GTL MS	Storage Tank, MTG Heavy Gasoline	42.009	MTG heavy gasoline	714000	GAL	internal floating roof, white or aluminum surface	0		BACT-PSD
TX-0851	RIO BRAVO PIPELINE FACILITY	Thermal Oxidizer	13.31	NATL GAS	71.3	MMBTU/HR	Natural Gas / Clean Fuel, good combustion practices.	0.0054	LB/MMBTU	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	FRONT END PROCESS FLARE	19.31	NATURAL GAS PILOT	0.25	MMBTU/H	NATURAL GAS FOR PILOT, FLARE MINIMIZATION PRACTICES	0.0054	LB/MMBTU	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	UAN PLANT VENT FLARE	19.31		0.19	MMBTU/H	NATURAL GAS PILOT, FLARE MINIMIZATION PRACTICES	0.0054	LB/MMBTU	BACT-PSD
LA-0213	ST. CHARLES REFINERY	HEATER F-72-703 (7-81)	11.39	REFINERY FUEL GAS	633	MMBTU/H	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	THERMAL OXIDIZERS (2008-32, 2008-33, 2008-34)	50.008	PROCESS FUEL GAS	15	MMBTU/H EA	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	SRU THERMAL OXIDIZERS (99-3, 99-4, 2005-39, 2007-4)	50.006		50	MMBTU/H	PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0.34	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	HEATERS (94-21 & 94-29)	13.39	REFINERY FUEL GAS			PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES, AND USE OF GASEOUS FUELS	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	CPF HEATER H-39-03 & H-39-02 (94-28 & 94-30)	13.39	REFINERY FUEL GAS			PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES, AND USE OF GASEOUS FUELS	0.0054	LB/MMBTU	BACT-PSD
LA-0213	ST. CHARLES REFINERY	LOADINGS - AROMATIC RECOVERY UNIT	64.005				RAILCAR LOADING: COMPLY WITH 40 CFR 63 SUBPART G MARINE LOADING: COMPLY WITH 40 CFR 61 SUBPART BB	0		BACT-PSD
*LA-0312	ST. JAMES METHANOL PLANT	MPST-14 - Methanol Product Surge Tank (EQT0019)	42.009	Methanol	41000	gallons	Route emissions to Methanol Product Tanks A & B	0		BACT-PSD
*LA-0312	ST. JAMES METHANOL PLANT	SV1-14 - Crude Methanol Tank Scrubber Vent (EQT0020)	99.999	Methanol	50	gallons/min	Route to reformer fuel gas system except during times of eductor downtime	1.84	LB/HR	BACT-PSD
LA-0213	ST. CHARLES REFINERY	PROCESS VENTS - REFINERY (CCEX)	50.999				ROUTE TO THE FUEL GAS SYSTEMS OR FLARES OR COMPLY WITH 40 CFR 63 SUBPART CC	0		BACT-PSD
TX-0850	CORPUS CHRISTI TERMINAL	Heavy oil storage in fixed roof tank	42.005		0		Storage of heavy oil (EPN: T-1334) in a fixed roof tank with VP < 0.5 psia, painted white and equipped with submerged fill pipe.	0		BACT-PSD
LA-0276	BATON ROUGE JUNCTION FACILITY	Vertical Fixed Roof Tanks 174, 175, 176	42.005		0		Submerged fill pipes and pressure/vacuum vents	0		BACT-PSD
AR-0124	EL DORADO SAWMILL	THREE DIESEL STORAGE TANKS SN-15	42.009		0		TANKS ARE LIGHT COLOR	0.4	LB/H	BACT-PSD

TABLE C2 - RBLC VOC DATA SEARCH FOR VOLATILE ORGANIC LIQUID STORAGE (SECTION 42.009)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
TX-0851	RIO BRAVO PIPELINE FACILITY	Natural Gas Liquid Condensate Tanks and Condensate Loading	42.009		0		THERMAL OXIDIZER	0		BACT-PSD
TX-0851	RIO BRAVO PIPELINE FACILITY	Liquefied Natural Gas Storage Tanks	42.009		0		THERMAL OXIDIZER	0		BACT-PSD
TX-0851	RIO BRAVO PIPELINE FACILITY	LNG Export Acid Gas Removal Unit	50.006		0		THERMAL OXIDIZER	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	LOADINGS - REFINERY	50.004				TRUCK/RAILCAR LOADING: COMPLY WITH 40 CFR 63 SUBPART CC	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Boom Flare	19.39	Natural Gas	0		Use of good combustion practices and proper flare maintenance	0		BACT-PSD
FL-0328	ENI - HOLY CROSS DRILLING PROJECT	Emergency Engine	17.11	Diesel	0		Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine	0.03	TONS PER YEAR	BACT-PSD
FL-0328	ENI - HOLY CROSS DRILLING PROJECT	Emergency Fire Pump Engine	17.11	Diesel	0		Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine	0.002	TONS PER YEAR	BACT-PSD
FL-0328	ENI - HOLY CROSS DRILLING PROJECT	Storage Tanks	42.009	Diesel	0		Use of good maintenance practices based on the current manufacturerâ€™s specifications for each tank	0.27	TONS PER YEAR	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Storage Tanks	42.009	Diesel	0		Use of good maintenance practices to minimize fugitive emissions, including minimizing the release of emissions from valves, pump seals, and connectors.	0.71	TONS	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Condensate Tank	42.009		0		Use of good maintenance practices to minimize fugitive emissions, including minimizing the release of emissions from valves, pump seals, and connectors.	9.26	TONS	BACT-PSD
TX-0840	CORPUS CHRISTI TERMINAL	TANK MSS	42.006		0		VCU	0		BACT-PSD
MS-0092	EMBERCLEAR GTL MS	Storage Tank, crude methanol storage	42.009	crude methanol	1470000	GAL	Water scrubber	0		BACT-PSD
TX-0656	GAS TO GASOLINE PLANT	Fixed Roof Tanks (3)	42.005		800000	GAL/YR	WATER SCRUBBER	1.65	T/YR	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	ONE (1) DIESEL EXHAUST FLUID (DEF) TANK	42.009		100	TONS UAN	WHITE TANK SHELL, SUBMERGED FILL	0		BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	THREE (3) UAN DAY TANKS	42.009		750	TONS UAN, EACH	WHITE TANK SHELLS, SUBMERGED FILL	0		BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	TWO (2) UAN STORAGE TANKS	42.009		30000	TONS UAN, EACH	WHITE TANK SHELLS, USE SUBMERGED FILL.	0		BACT-PSD
TX-0663	JACKSON COUNTY GAS PLANT	Produced Water Tanks	42.009		0		White, submerged fill	0		BACT-PSD
TX-0663	JACKSON COUNTY GAS PLANT	Fixed Roof Tanks	42.009		0		White, submerged fill	0		BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
*OH-0374	GUERNSEY POWER STATION LLC	Emergency Generators (2 identical, P004 and P005)	17.11	Diesel fuel	2206	HP	Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual.	23.21	LB/H	BACT-PSD
*OH-0378	PTTGCA PETROCHEMICAL COMPLEX	Firewater Pumps (P005 and P006)	17.21	Diesel fuel	402	HP	Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII and employ good combustion practices per the manufacturerâ€™s operating manual	2.64	LB/H	BACT-PSD
*OH-0378	PTTGCA PETROCHEMICAL COMPLEX	Emergency Diesel-fired Generator Engine (P007)	17.11	Diesel fuel	3353	HP	certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual	37.41	LB/H	BACT-PSD
*OH-0378	PTTGCA PETROCHEMICAL COMPLEX	1,000 kW Emergency Generators (P008 - P010)	17.11	Diesel fuel	1341	HP	certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual	14.96	LB/H	BACT-PSD
*OH-0374	GUERNSEY POWER STATION LLC	Emergency Fire Pump (P006)	17.21	Diesel fuel	410	HP	Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual	2.7	LB/H	BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	TWO (2) FIREWATER PUMP DIESEL ENGINES	17.21	DIESEL	371	BHP, EACH	COMBUSTION DESIGN CONTROLS AND USAGE LIMITS	3	G/HP-H	BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	TWO (2) EMERGENCY DIESEL GENERATORS	17.11	DIESEL	1006	HP EACH	COMBUSTION DESIGN CONTROLS AND USAGE LIMITS	4.8	G/HP-H	BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	COMBUSTION DESIGN CONTROLS AND USAGE LIMITS	4.8	G/HP-H	BACT-PSD
NY-0103	CRICKET VALLEY ENERGY CENTER	Emergency fire pump	17.21	ultra low sulfur diesel	460	hp	Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations.	2.6	G/BHP-H	LAER
LA-0301	LAKE CHARLES CHEMICAL COMPLEX ETHYLENE 2 UNIT	Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999)	17.21	Diesel	500	HP	Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage	3.21	LB/HR	BACT-PSD
LA-0313	ST. CHARLES POWER STATION	SCPS Emergency Diesel Generator 1	17.11	Diesel	2584	HP	Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel).	27.34	LB/H	BACT-PSD
LA-0313	ST. CHARLES POWER STATION	SCPS Emergency Diesel Firewater Pump 1	17.21	Diesel	282	HP	Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel).	1.87	LB/H	BACT-PSD
*OH-0376	IRONUNITS LLC - TOLEDO HBI	Emergency diesel-fueled fire pump (P006)	17.21	Diesel fuel	250	HP	Comply with NSPS 40 CFR 60 Subpart IIII	1.6	LB/H	BACT-PSD
*OH-0376	IRONUNITS LLC - TOLEDO HBI	Emergency diesel-fired generator (P007)	17.11	Diesel fuel	2682	HP	Comply with NSPS 40 CFR 60 Subpart IIII	28.2	LB/H	BACT-PSD
LA-0309	BENTELER STEEL TUBE FACILITY	Firewater Pump Engines	17.21	Diesel	288	hp (each)	Complying with 40 CFR 60 Subpart IIII	3	G/BHP-HR	BACT-PSD
LA-0309	BENTELER STEEL TUBE FACILITY	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	Complying with 40 CFR 60 Subpart IIII	6.4	G/KW-HR	BACT-PSD
LA-0316	CAMERON LNG FACILITY	emergency generator engines (6 units)	17.11	diesel	3353	hp	Complying with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0314	INDORAMA LAKE CHARLES FACILITY	Diesel Firewater pump engines (6 units)	17.21	diesel	425	hp	complying with 40 CFR 63 subpart ZZZZ	0		BACT-PSD
LA-0314	INDORAMA LAKE CHARLES FACILITY	Diesel emergency generator engine - EGEN	17.21	diesel	350	hp	complying with 40 CFR 63 subpart ZZZZ	0		BACT-PSD
OH-0363	NTE OHIO, LLC	Emergency generator (P002)	17.11	Diesel fuel	1100	KW	Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII	29.01	LB/H	BACT-PSD
OH-0363	NTE OHIO, LLC	Emergency Fire Pump Engine (P003)	17.21	Diesel fuel	260	HP	Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII	1.72	LB/H	BACT-PSD
SC-0113	PYRAMAX CERAMICS, LLC	EMERGENCY GENERATORS 1 THRU 8	17.11	DIESEL	757	HP	ENGINES MUST BE CERTIFIED TO COMPLY WITH NSPS, SUBPART IIII.	4	GR/KW-H	BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
WY-0070	CHEYENNE PRAIRIE GENERATING STATION	Diesel Emergency Generator (EP15)	17.11	Ultra Low Sulfur Diesel	839	hp	EPA Tier 2 rated	0		BACT-PSD
WY-0070	CHEYENNE PRAIRIE GENERATING STATION	Diesel Fire Pump Engine (EP16)	17.21	Ultra Low Sulfur Diesel	327	hp	EPA Tier 3 rated	0		BACT-PSD
WY-0071	SINCLAIR REFINERY	Emergency Air Compressor	17.21	Ultra Low Sulfur Diesel	400	hp	EPA Tier 3 Rated Diesel Engine	0		BACT-PSD
CA-1192	AVENAL ENERGY PROJECT	EMERGENCY FIREWATER PUMP ENGINE	17.21	DIESEL	288	HP	EQUIPPED W/ A TURBOCHARGER AND AN INTERCOOLER/AFTERCOOLER	3.4	G/HP-H	BACT-PSD
MD-0041	CPV ST. CHARLES	EMERGENCY GENERATOR	17.21	ULTRA-LOW SULFUR DIESEL	1500	KW	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION	4.8	G/HP-H	LAER
MD-0041	CPV ST. CHARLES	EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP	17.21	ULTRA-LOW SULFUR DIESEL	300	HP	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION	3	G/HP-H	LAER
MD-0046	KEYS ENERGY CENTER	DIESEL-FIRED FIRE PUMP ENGINE	17.21	ULTRA-LOW SULFUR DIESEL	300	HP	EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES	4	G/KW-H	BACT-PSD
MD-0045	MATTAWOMAN ENERGY CENTER	EMERGENCY GENERATOR	17.21	ULTRA-LOW SULFUR DIESEL	1490	HP	EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	6.4	G/KW-H	BACT-PSD
MD-0046	KEYS ENERGY CENTER	DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES (TWO)	17.21	ULTRA-LOW SULFUR DIESEL	1500	KW	EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	6.4	G/KW-H	BACT-PSD
MD-0045	MATTAWOMAN ENERGY CENTER	EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP	17.21	ULTRA-LOW SULFUR DIESEL	305	HP	EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	4	G/KW-H	LAER
NY-0103	CRICKET VALLEY ENERGY CENTER	Black start generator	17.11	ultra low sulfur diesel	3000	KW	Generator equipped with selective catalytic reduction. Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations.	2.11	G/BHP-H	LAER
LA-0308	MORGAN CITY POWER PLANT	2000 KW Diesel Fired Emergency Generator Engine	17.11	Diesel	20.4	MMBTU/hr	Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII	33.07	LB/H	BACT-PSD
LA-0308	MORGAN CITY POWER PLANT	380 HP Diesel Fired Pump Engine	17.21	Diesel	2.3	MMBTU/hr	Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII	2.92	LB/H	BACT-PSD
*OH-0368	PALLAS NITROGEN LLC	Emergency Fire Pump Diesel Engine (P008)	17.21	Diesel fuel	460	HP	good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII	0.3	LB/H	BACT-PSD
*OH-0368	PALLAS NITROGEN LLC	Emergency Generator (P009)	17.11	Diesel fuel	5000	HP	good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII	5.5	LB/H	BACT-PSD
*AK-0084	DONLIN GOLD PROJECT	Black Start and Emergency Internal Cumbustion Engines	17.11	Diesel	1500	kWe	Good Combustion Practices	8	G/KW-HR	BACT-PSD
*AK-0084	DONLIN GOLD PROJECT	Fire Pump Diesel Internal Combustion Engines	17.21	Diesel	252	hp	Good Combustion Practices	3.7	G/KW-HR	BACT-PSD
MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	Emergency Engine --Diesel Fire Pump (EUFPENGINE)	17.21	Diesel	165	HP	Good combustion practices	3	G/HP-H	BACT-PSD
IA-0105	IOWA FERTILIZER COMPANY	Emergency Generator	17.11	diesel fuel	142	GAL/H	good combustion practices	6	G/KW-H	BACT-PSD
IA-0105	IOWA FERTILIZER COMPANY	Fire Pump	17.21	diesel fuel	14	GAL/H	good combustion practices	3.75	G/KW-H	BACT-PSD
IN-0173	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	17.21	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	2.83	G/BHP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	17.21	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	2.83	G/B-HP-H	BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
IN-0234	GRAIN PROCESSING CORPORATION	EMERGENCY FIRE PUMP ENGINE	17.21	DISTILLATE OIL	0		GOOD COMBUSTION PRACTICES	9.5	G/HP-H	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	DIESEL-FIRED EMERGENCY GENERATOR	17.11	NO. 2 FUEL OIL	4690	B-HP	GOOD COMBUSTION PRACTICES	4.46	G/B-HP-H	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	DIESEL-FIRED EMERGENCY WATER PUMP	17.21	NO. 2 FUEL OIL	481	BHP	GOOD COMBUSTION PRACTICES	2.86	G/B-HP-H	BACT-PSD
IN-0173	MIDWEST FERTILIZER CORPORATION	DIESEL FIRED EMERGENCY GENERATOR	17.11	NO. 2, DIESEL	3600	BHP	GOOD COMBUSTION PRACTICES	4.46	G/BHP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	DIESEL FIRED EMERGENCY GENERATOR	17.11	NO. 2, DIESEL	3600	BHP	GOOD COMBUSTION PRACTICES	4.46	G/B-HP-H	BACT-PSD
*OH-0377	HARRISON POWER	Emergency Diesel Generator (P003)	17.11	Diesel fuel	1860	HP	Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII	19.68	LB/H	BACT-PSD
*OH-0377	HARRISON POWER	Emergency Fire Pump (P004)	17.21	Diesel fuel	320	HP	Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII	2.12	LB/H	BACT-PSD
MD-0044	COVE POINT LNG TERMINAL	EMERGENCY GENERATOR	17.11	ULTRA LOW SULFUR DIESEL	1550	HP	GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMIT	4.8	G/HP-H	LAER
MD-0044	COVE POINT LNG TERMINAL	5 EMERGENCY FIRE WATER PUMP ENGINES	17.21	ULTRA LOW SULFUR DIESEL	350	HP	GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMIT	3	G/HP-H	LAER
LA-0204	PLAQUEMINE PVC PLANT	SMALL EMERGENCY ENGINES	17.21	DIESEL			GOOD COMBUSTION PRACTICES AND GASEOUS FUEL BURNING	4.41	LB/MMBTU	BACT-PSD
LA-0204	PLAQUEMINE PVC PLANT	LARGE EMERGENCY ENGINES	17.11	DIESEL			GOOD COMBUSTION PRACTICES AND GASEOUS FUEL BURNING	3.2	LB/MMBTU	BACT-PSD
MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	EUEMENGINE (South Plant): Emergency Engine	17.11	Diesel	1341	HP	Good combustion practices and meeting NSPS IIII requirements.	6.4	G/KW-H	BACT-PSD
MI-0423	INDECK NILES, LLC	EUEMENGINE (Diesel fuel emergency engine)	17.11	Diesel Fuel	22.68	MMBTU/H	Good combustion practices and meeting NSPS IIII requirements.	6.4	G/KW-H	BACT-PSD
MI-0423	INDECK NILES, LLC	EUFPENGINE (Emergency engine--diesel fire pump)	17.21	Diesel	1.66	MMBTU/H	Good combustion practices and meeting NSPS Subpart IIII requirements.	3	G/BHP-H	BACT-PSD
MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	EUFPENGINE (South Plant): Fire pump engine	17.21	Diesel	300	HP	Good combustion practices and meeting NSPS Subpart IIII requirements.	3	G/BHP-H	BACT-PSD
MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	EUEMENGINE (North Plant): Emergency Engine	17.11	Diesel	1341	HP	Good combustion practices and meeting NSPS Subpart IIII requirements.	6.4	G/KW-H	BACT-PSD
MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	EUFPENGINE (North Plant): Fire pump engine	17.21	Diesel	300	HP	Good combustion practices and meeting NSPS Subpart IIII requirements.	3	G/BHP-H	BACT-PSD
LA-0328	PLAQUEMINES PLANT 1	Emergency Diesel Engine Pump P-39A	17.21	Diesel Fuel	375	HP	Good combustion practices and NSPS IIII	4	G/KW-H	BACT-PSD
LA-0328	PLAQUEMINES PLANT 1	Emergency Diesel Engine Pump P-39B	17.21	Diesel Fuel	300	HP	Good combustion practices and NSPS Subpart IIII	4	G/KW-H	BACT-PSD
*VA-0328	C4GT, LLC	Emergency Diesel GEN	17.11	Ultra Low Sulfur Diesel	500	H/YR	good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw.	4.8	G/HP H	BACT-PSD
*VA-0328	C4GT, LLC	Emergency Fire Water Pump	17.21	Ultra Low Sulfur Diesel	500	HR/YR	Good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw.	3	G/HP-HR	BACT-PSD
MD-0043	PERRYMAN GENERATING STATION	EMERGENCY GENERATOR	17.11	ULTRA LOW SULFUR DIESEL	1300	HP	GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD	4.8	G/HP-H	LAER
MD-0043	PERRYMAN GENERATING STATION	EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP	17.21	ULTRAL LOW SULFUR DIESEL	350	HP	GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD	3	G/HP-H	LAER

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
WI-0263	WISCONSIN POWER & LIGHT - NEENAH GENERATING STATION	Fire pump (process P05)	17.21	Diesel	1.27	mmBtu/hr	Good combustion practices, use diesel fuel, and operate <500 hr/yr	0		BACT-PSD
MI-0424	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	EUFPENGINE (Emergency engine--diesel fire pump)	17.21	diesel	500	H/YR	Good combustion practices.	3	G/HP-H	BACT-PSD
MI-0434	FLAT ROCK ASSEMBLY PLANT	EUENGINE01 through EUENGINE08	17.11	Diesel	3633	BHP	Good combustion practices.	6.4	G/KW-H	BACT-PSD
MI-0434	FLAT ROCK ASSEMBLY PLANT	EUFIREPUMPENGS (2 emergency fire pump engines)	17.21	Diesel	250	BHP	Good combustion practices.	3	G/B-HP-H	BACT-PSD
MI-0434	FLAT ROCK ASSEMBLY PLANT	EULIFESAFETYENG - One diesel-fueled emergency engine/generator	17.21	Diesel	500	KW	Good combustion practices.	4	G/KW-H	BACT-PSD
MI-0399	DETROIT EDISON--MONROE	4 Diesel-fired quench pumps	17.21	Diesel fuel	252	HP	Good combustion practices.	7.8	G/HP-H	BACT-PSD
*MD-0042	WILDCAT POINT GENERATION FACILITY	EMERGENCY GENERATOR 1	17.11	ULTRA LOW SULFU DIESEL	2250	KW	LIMITED OPERATING HOURS, USE OF ULTRA- LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	4.8	G/HP-H	LAER
*MD-0042	WILDCAT POINT GENERATION FACILITY	EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP	17.21	ULTRA LOW SULFUR DIESEL	477	HP	LIMITED OPERATING HOURS, USE OF ULTRA- LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	3	G/HP-H	LAER
AK-0083	KENAI NITROGEN OPERATIONS	Diesel Fired Well Pump	17.21	Diesel	2.7	MMBTU/H	Limited Operation of 168 hr/yr.	4.41	LB/MMBTU	BACT-PSD
FL-0354	LAUDERDALE PLANT	Emergency fire pump engine, 300 HP	17.21	Diesel	29	MMBTU/H	Low-emitting fuel and certified engine	4	G / KWH	BACT-PSD
TX-0846	MOTOR VEHICLE ASSEMBLY PLANT	FIRE PUMP DIESEL ENGINE	17.21	NO 2 DIESEL	214	kW	Meets EPA Tier 4 requirements	0.4	G/KW	BACT-PSD
*FL-0367	SHADY HILLS COMBINED CYCLE FACILITY	1,500 kW Emergency Diesel Generator	17.11	ULSD	14.82	MMBtu/hour	Operate and maintain the engine according to the manufacturer's written instructions	6.4	G/KW-HOUR	BACT-PSD
*FL-0367	SHADY HILLS COMBINED CYCLE FACILITY	Emergency Fire Pump Engine (347 HP)	17.21	ULSD	8700	gal/year	Operate and maintain the engine according to the manufacturer's written instructions	4	G/KW-HR	BACT-PSD
CA-1191	VICTORVILLE 2 HYBRID POWER PROJECT	EMERGENCY ENGINE	17.11	DIESEL	2000	KW	OPERATIONAL RESTRICTION OF 50 HR/YR	6	G/KW-H	BACT-PSD
CA-1191	VICTORVILLE 2 HYBRID POWER PROJECT	EMERGENCY FIREWATER PUMP ENGINE	17.21	DIESEL	135	KW	OPERATIONAL RESTRICTION OF 50 HR/YR, OPERATE AS REQUIRED FOR FIRE SAFETY TESTING	3.8	G/KW-H	BACT-PSD
MI-0410	THETFORD GENERATING STATION	EU-FPENGINE: Diesel fuel fired emergency backup fire pump	17.21	diesel fuel	315	hp nameplate	Proper combustion design and ultra low sulfur diesel fuel.	3	G/HP-H	BACT-PSD
LA-0323	MONSANTO LULING PLANT	Fire Water Diesel Pump No. 4 Engine	17.11	Diesel Fuel	600	hp	Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0323	MONSANTO LULING PLANT	Standby Generator No. 9 Engine	17.21	Diesel Fuel	400	hp	Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0323	MONSANTO LULING PLANT	Fire Water Diesel Pump No. 3 Engine	17.11	Diesel Fuel	600	hp	Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
SC-0113	PYRAMAX CERAMICS, LLC	FIRE PUMP	17.21	DIESEL	500	HP	PURCHASE OF CERTIFIED ENGINE BASED ON NSPS, SUBPART IIII.	4	GR/KW-H	BACT-PSD
SC-0113	PYRAMAX CERAMICS, LLC	EMERGENCY ENGINE 1 THRU 8	17.21	DIESEL	29	HP	PURCHASE OF CERTIFIED ENGINE.	7.5	GR/KW-H	BACT-PSD
OH-0352	OREGON CLEAN ENERGY CENTER	Emergency fire pump engine	17.21	diesel	300	HP	Purchased certified to the standards in NSPS Subpart IIII	1.7	LB/H	BACT-PSD
OH-0352	OREGON CLEAN ENERGY CENTER	Emergency generator	17.11	diesel	2250	KW	Purchased certified to the standards in NSPS Subpart IIII	27.8	LB/H	BACT-PSD
OH-0360	CARROLL COUNTY ENERGY	Emergency generator (P003)	17.11	diesel	1112	KW	Purchased certified to the standards in NSPS Subpart IIII	13.74	LB/H	BACT-PSD
OH-0360	CARROLL COUNTY ENERGY	Emergency fire pump engine (P004)	17.21	diesel	400	HP	Purchased certified to the standards in NSPS Subpart IIII	2.3	LB/H	BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
MI-0435	BELLE RIVER COMBINED CYCLE POWER PLANT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	State of the art combustion design.	6.4	G/KW-H	BACT-PSD
MI-0435	BELLE RIVER COMBINED CYCLE POWER PLANT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	State of the art combustion design.	4	G/KW-H	BACT-PSD
*OH-0366	CLEAN ENERGY FUTURE - LORDSTOWN, LLC	Emergency fire pump engine (P004)	17.21	Diesel fuel	140	HP	State-of-the-art combustion design	0.81	LB/H	BACT-PSD
*OH-0366	CLEAN ENERGY FUTURE - LORDSTOWN, LLC	Emergency generator (P003)	17.11	Diesel fuel	2346	HP	State-of-the-art combustion design	21.6	LB/H	BACT-PSD
*OH-0367	SOUTH FIELD ENERGY LLC	Emergency fire pump engine (P004)	17.21	Diesel fuel	311	HP	State-of-the-art combustion design	1.79	LB/H	BACT-PSD
*OH-0367	SOUTH FIELD ENERGY LLC	Emergency generator (P003)	17.11	Diesel fuel	2947	HP	State-of-the-art combustion design	27.18	LB/H	BACT-PSD
*OH-0370	TRUMBULL ENERGY CENTER	Emergency generator (P003)	17.11	Diesel fuel	1529	HP	State-of-the-art combustion design	16.07	LB/H	BACT-PSD
*OH-0370	TRUMBULL ENERGY CENTER	Emergency fire pump engine (P004)	17.21	Diesel fuel	300	HP	State-of-the-art combustion design	1.97	LB/H	BACT-PSD
*OH-0372	OREGON ENERGY CENTER	Emergency generator (P003)	17.11	Diesel fuel	1529	HP	State-of-the-art combustion design	16.1	LB/H	BACT-PSD
*OH-0372	OREGON ENERGY CENTER	Emergency fire pump engine (P004)	17.21	Diesel fuel	300	HP	State-of-the-art combustion design	1.97	LB/H	BACT-PSD
ID-0018	LANGLEY GULCH POWER PLANT	EMERGENCY GENERATOR ENGINE	17.11	DIESEL	750	KW	TIER 2 ENGINE-BASED, GOOD COMBUSTION PRACTICES (GCP)	6.4	G/KW-H	BACT-PSD
ID-0018	LANGLEY GULCH POWER PLANT	FIRE PUMP ENGINE	17.21	DIESEL	235	KW	TIER 3 ENGINE-BASED GOOD COMBUSTION PRACTICES (GCP)	4	G/KW-H	BACT-PSD
*OH-0379	PETMIN USA INCORPORATED	Black Start Generator (P007)	17.21	Diesel fuel	158	HP	Tier IV engine Tier IV NSPS standards certified by engine manufacturer.	0.104	LB/H	BACT-PSD
*OH-0379	PETMIN USA INCORPORATED	Emergency Generators (P005 and P006)	17.11	Diesel fuel	3131	HP	Tier IV engine Tier IV NSPS standards certified by engine manufacturer.	3.45	LB/H	BACT-PSD
IL-0114	CRONUS CHEMICALS, LLC	Emergency Generator	17.11	distillate fuel oil	3755	HP	Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7.	0.67	G/KW-H	BACT-PSD
IL-0114	CRONUS CHEMICALS, LLC	Firewater Pump Engine	17.21	distillate fuel oil	373	hp	Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7.	3.5	G/KW-H	BACT-PSD
FL-0348	MURPHY EXPLORATION & PRODUCTION CO.	Drill Floor and Crew Quarters Electrical Generators	17.11	Diesel	6789	hp	Use of engine with turbo charger with after cooler, an enhanced work practice power management, NOx emissions maintenance system, and good combustion and maintenance practices based on the current manufacturerâ€™s specifications for each engine.	26	G/KW-H	BACT-PSD
FL-0348	MURPHY EXPLORATION & PRODUCTION CO.	Emergency Electrical Generator	17.11	Diesel	1100	hp	Use of good combustion and maintenance practices based on the current manufacturerâ€™s specifications for this engine.	0.22	TONS	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Fast Rescue Craft Diesel Engine - C.R. Luigs	17.11	diesel	142	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel	0		BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Life Boat Diesel Engines - C.R. Luigs	17.21	diesel	39	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel	0		BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Fast Rescue Craft Diesel Engine - Development Driller 1	17.21	Diesel	142	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger	0		BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Seismic Operations Diesel Engines - Development Driller 1	17.21	Diesel	415	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger	3.54	TONS	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs	17.21	diesel	305	HP	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler	82.83	T/12MO ROLLING TOTAL	BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
FL-0338	SAKE PROSPECT DRILLING PROJECT	Emergency Generator Diesel Engine - C.R. Luigs	17.11	diesel	2064	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler	1.49	T/12MO ROLLING TOTAL	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs	17.21	diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler	8.69	T/12MO ROLLING TOTAL	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Diesel Powered Forklift Engine	17.21	Diesel	30	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Well Evaluation Diesel Engine	17.21	Diesel	140	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Escape Capsule Diesel Engine	17.21	Diesel	39	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Wireline Diesel Engines	17.21	Diesel	0		Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Water Blasting Diesel Engine	17.21	Diesel	208	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Fast Rescue Craft Diesel Engine	17.21	Diesel	230	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Main Propulsion Generator Diesel Engines	17.11	Diesel	9910	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	12.7	G/KW-H	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Emergency Diesel Engine	17.11	Diesel	3300	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Remotely Operated Vehicle Emergency Generator	17.21	Diesel	427	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Flowback Boiler	13.22	Diesel	8	MMBTU/H	Use of good combustion practices based on the most recent manufacturer's specifications issued for this boiler	0		BACT-PSD
FL-0324	PALM BEACH RENEWABLE ENERGY PARK	250 Kw Emergency Generator	17.21	ULSD	0		Use of inherently clean ultra low sulfur distillate (ULSD) fuel oil and GCP	4	G/KW-H	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Caterpillar C18DITA Diesel Engine Generator	17.11	No. 2 Distillate Fuel Oil	900	BHP	utilize efficient combustion/design technology	14	LB/HR	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump	17.21	No. 2 Fuel Oil	182	BHP	utilize efficient combustion/design technology	2	LB/HR	BACT-PSD

Appendix D
BACT Cost Analysis Sheets

Table D1a – Estimated CO Catalyst System Capital Costs for TGL Generators (4 MMBtu/hr)

CAPITAL COST ESTIMATION FACTORS FOR CO system		
ITEM	**BASIS**	**Calculated Value**
DIRECT COSTS		
Purchased Equipment Cost		
Equipment Cost + Auxiliaires	Vendor Estimate Cost	50,871
Instrumentation	0.10 * A	5,087
Sales Tax	0.065 * A	3,307
Freight	0.05 *A	2,544
Total Purchased Equipment Cost (PEC)	B=1.215 * A	**61,809**
Direct Installation Costs		
Foundations and Supports	0.08 * B	4,945
Handling and Erection	0.14 * B	8,653
Electrical	0.04 * B	2,472
Piping	0.02 * B	1,236
Insultation for Ductwork	0.01 * B	618
Painting	0.01 * B	618
Total Direct Installation Cost	C=1.30 * B	**80,351**
Site Preparation, (SP)	As Required	2,000
Buildings, (Bldg)	As Required	2,000
Total Direct Cost, DC	C + SP + Bldg	**84,351**
INDIRECT COSTS		
Engineering	0.10 * B	6,181
Construction and Field Expenses	0.05 * B	3,090
Contractor Fees	0.10 * B	6,181
Start-Up	0.02 * B	1,236
Performance Test	0.01 * B	618
Contingencies	Variable = 35%	21,633
Total Indirect Cost, IC	0.28 * B + Contin. + IDC	**38,939**
Total Capital Investment (TCI)	**DC + IC**	**123,291**

Table D1b – Annual CO Catalyst System Operating Costs for TGL Generators (4 MMBtu/hr)

ANNUALIZED COST FACTORS FOR CO SYSTEM			
ITEM	**COST FACTOR**	**UNIT COST**	**COST, $**
DIRECT ANNUAL COSTS (DC)			
Operating Labor			
Operator	0.5 hr/shift	$50/hr	27,375
Supervisor	15% Operating Labor	NA	4,106
Maintenance			
CO Catalyst Labor Requirement	0.5 hour per day	$60/hr	10,950
Catalyst Replacement Labor	8 workers - 80 hrs every 5 yrs	$60/hr	7,680
Material	100% maintenance labor	NA	18,630
Supervisor	15% labor	NA	2,795
Catalyst	100% replaced/5 years		9,147
INDIRECT ANNUAL COSTS (IC)			
Overhead	60% * (labor + materials)	60% of O&M costs	48,410
Administrative Charges	2% TCI	2% of Total Capital Invest.	2,466
Property Taxes	1% TCI	1% of Total Capital Invest.	1,233
Insurance	1% TCI	1% of Total Capital Invest.	1,233
Capital Recovery	CRF * TCI	20 yr life; 7% Int.	11,639
Total Annual Cost (TAC) ($)	Sum of Annual Costs		**145,663**
Tons VOC removed	@ 15% O2 (60% Reduction)		0.7
Cost per ton of VOC ($/ton)			**211,106**

1) Labor Assumption of 3 shifts/day for 365 days/yr

2) CRF =0.0944 assuming 7% interest over 20 years

Table D2a – Estimated SCR System Capital Costs for TGL Generators Operated 8,760 hrs/yr

ITEM		BASIS	Calculated Value
DIRECT COSTS			
Purchased Equipment Cost			
Equipment Cost + Auxiliaires		[A]	**138,483**
Instrumentation		0.10 * A	13,848
Sales Tax		0.065 * A	9,001
Freight		0.05 *A	6,924
Total Purchased Equipment Cost (PEC)		B=1.215 * A	**168,257**
Direct Installation Costs			
Foundations and Supports		0.08 * B	13,461
Handling and Erection		0.14 * B	23,556
Electrical		0.05 * B	8,413
Piping		0.02 * B	3,365
Insultation for Ductwork		0.01 * B	1,683
Painting		0.01 * B	1,683
Total Direct Installation Cost		C=1.31 * B	220,416
Site Preparation, (SP)		As Required	10,000
Buildings, (Bldg)		As Required	10,000
Total Direct Cost, DC			**240,416**
INDIRECT COSTS			
Engineering		0.10 * B	16,826
Construction and Field Expenses		0.05 * B	8,413
Contractor Fees		0.10 * B	16,826
Start-Up		0.02 * B	3,365
Performance Test		Manufacturer	10,000
Total Indirect Costs, IDC			**55,429**
Project Contingency		35%	103,546
Inventory Capital		1000 gal 32.5% Aqueous Ammonia	29,063
Simple Interest During Construction, (IDC)		DC * i * n	24,042
i = interest rate (5%), n = interest periods (2 yrs)			
Total Capital Investment (TCI)			**452,496**

[A] Estimated SCR with Silencer Equipment costs based on two vendors (Maxim and Miratech)

Table D2b – Annual SCR System Operating Costs for TGL Generators

ITEM	COST FACTOR	UNIT COST	COST, $
DIRECT ANNUAL COSTS (DC)			
Operating Labor			
Operator	0.5 hr/shift	$50/hr	2,250
Supervisor	15% Operating Labor	NA	338
Maintenance			
Annual Maintenance		1.5% of TCI	6,787
Catalyst Replacement Labor	8 workers - 80 hrs every 3 yrs	$60/hr	22,800
Ammonia Sys. Maint. Labor	20 hr/yr	$60/hr	3,200
Ammonia	19% Aqueous Ammonia	$360/ton	24,037
Catalyst	100% replaced / 3 years	Catalyst Replacement	20,039
INDIRECT ANNUAL COSTS (IC)			
Administrative Charges	2% TCI		9,050
Property Taxes	1% TCI		4,525
Insurance	1% TCI		4,525
Capital Recovery	CRF * TCI		42,716
Total Annual Cost (TAC) ($)	Sum of Annual Costs		**140,266**
Total Pollutants (NOx) Controlled (ton/yr)	As Calculated		13
COST EFFECTIVENESS ($/TON)	TAC/tpy controlled		**11,038**

*** CRF = 0.0944 assuming 7% interest over 20 years**

*** Vendor projected removal efficiencies: 90% N0x**

Appendix E
Air Quality Analysis in Support of Major New Source

Air Quality Analysis
In Support of a Major New Source

Texas GulfLink, LLC
Texas GulfLink Project
Brazoria County, Texas

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December 13, 2019

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1.0 PROJECT OVERVIEW

Sentinel Midstream LLC (Sentinel) proposes to construct and operate an offshore Deepwater Port Facility and the related infrastructure capable of transporting crude oil internationally via Very Large Crude Carrying (VLCC) vessels. This will be accomplished through the construction and operation of the proposed Texas GulfLink Deepwater Project consisting of shore based crude oil storage tanks, a 42" pipeline connecting the onshore storage facility to the offshore loading facility, a fully manned offshore loading platform, and two single point mooring (SPM) buoys to accommodate deep draft tankers that can export US produced crude oil to international markets. Figure 1 is a site location map showing the location of the proposed Deepwater Port Facility.

A New Source Review (NSR) applicability evaluation for the offshore Deepwater Port Facility demonstrates that proposed new emissions of Volatile Organic Compounds (VOC) and Nitrogen Oxides (NOx) exceed NSR *de minimis* emission levels. Therefore, the Deepwater Port Facility will be a major source of emissions under NSR. As such, the proposed project requires a federal Prevention of Significant Deterioration (PSD) construction permit following the requirements of 40 CFR 52.21 and a federal Title V operating permit following the requirements of 40 CFR 71. Both the PSD and Title V permit applications are being submitted under separate cover.

The modeling performed is in support of the PSD permit application, and the analyses described herein meet the requirements of 40 CFR 52.21(k). Additionally, the modeling analyses meet National Environmental Policy Act (NEPA) requirements to demonstrate that the proposed operations associated with the Deepwater Port will not result in a violation of the National Ambient Air Quality Standards (NAAQS). As part of NEPA guidance, modeling was performed to account for direct, indirect, and cumulative impacts from the proposed Texas GulfLink Project to satisfy the requirements of the June 2011 *Memorandum of Understanding regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the NEPA Process.* Finally, the modeling analyses follows the requirements of the Bureau of Ocean Energy Management's (BOEM) Gulf of Mexico Region (GOMR) air dispersion modeling guidelines (January 2018), which references Appendix W of 40 CFR 51 requirements for conducting the modeling and preparing the report.

Per Deepwater Port Act regulations (33 CFR 148.5), vessels are not considered primary/direct sources of emissions from the Project for Clean Air Act new source review regulatory applicability. Therefore, the modeling analyses address emissions from sources with an indirect impact (e.g. emissions from the VLCC itself, and other emission sources on the VLCC deck) to address the requirement of direct, indirect, and cumulative impacts from the Project.

Because the Deepwater Port (DWP) Act requires that the US EPA have jurisdiction over any DWP facility, this report summarizes a dispersion modeling assessment that determines the air quality impacts on the defined property boundary of the proposed offshore facility and surrounding water, in compliance with federal PSD requirements. Additionally, because Texas is the "nearest adjacent coastal state" to the proposed offshore facility, per DWP Act regulations, this report summarizes impacts determined based on Texas Commission on Environmental Quality (TCEQ) requirements related to fence-line impacts of applicable sulfur compounds and the agency's Health Effects Review procedures for applicable pollutants that have defined Effects Screening Level (ESL) limits.

2.0 POLLUTANTS TO BE MODELED

For the modeling analysis, the estimated potential emissions from emission sources associated with the SPM buoys system operations (including indirect impacts from the crude carrier itself and other emissions sources on the carrier) and the platform were included. The estimated potential maximum hourly emissions from these sources have been utilized for the short-term averaging period models in this dispersion modeling analysis and average hourly emissions for annual averaging periods.

For this modeling analysis, NO_x was modeled using the Tier 1 method from the September 30, 2014 US EPA Guidelines[1], where all NO_x emitted is modeled as nitrogen dioxide (NO_2) (i.e., full conversion of nitric oxide (NO) to NO_2) for the annual averaging period. This is a conservative approach as the majority of NO_x emissions are in the form of NO rather than NO_2.

The types of emission sources that were modeled for the proposed Texas GulfLink Project consist of combustion sources from the loading platform and the Very Large Crude Carrier (VLCC or Carrier) operations, including generators, cranes, and emergency equipment. Additionally, Carrier main and auxiliary engines, boilers, and crane engines were modeled. Finally, support vessels were modeled, including pilot boats, escort tugs, service support boats, and line hose boats. Stack height and other related modeling stack parameters were based on similar equipment that exist in the maritime industry. A worst-case impacts scenario was modeled that addresses a VLCC being loaded at one of the SPMs while another VLCC is transiting into the safety zone with its associated support vessels.

Proposed emergency equipment, including electric generator and firewater pump engines, will be permitted to operate less than 100 hours per year. Because the engines will only be tested less than one hour in any 24-hour period, the engines were modeled based on their annual average rate instead of the short-term maximum hourly rate. This is in accordance with the 2018 BOEM Modeling Guidance and US EPA's guidance for intermittent sources[2]. Table 2-1 shows the model input (maximum hourly) emission rates for the proposed sources of air emissions.

[1] Memorandum, Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard, US EPA, September 30, 2014.
[2] Memorandum, Additional Clarification regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard, March 1, 2011.

Table 2-1: Stack Parameters and Modeled Emission Rates

Source ID	Source Description	Latitude Decimal Degrees	Longitude Decimal Degrees	Base Elevation (m)	Stack Height Above Platform or Water[1] (m)	Temperature K	Exit Velocity mps	Stack Diameter (m)	PM_{10} Emissions 24-hr g/s	PM_{10} Emissions Annual g/s	$PM_{2.5}$ Emissions 24-hr g/s	$PM_{2.5}$ Emissions Annual g/s	NO_x Emissions 1-hr g/s	NO_x Emissions Annual g/s	CO Emissions g/s	SO_2 Emissions ST g/s	SO_2 Emissions Annual g/s	Height of Building m	Building Width m
PLATFORM SOURCES																			
G1	Generator 1	28.554283	95.027581	30	6.096	700	39.62	0.15	0.04	0.04	0.04	0.04	1.25	1.25	0.70	0.0013	0.0013	3	3.7
G2	Generator 2	28.554283	95.027581	30	6.096	700	39.62	0.15	0.04	0.04	0.04	0.04	1.25	1.25	0.70	0.0013	0.0013	3	3.7
C1	Crane 1	28.554543	95.027668	39	12.192	728	48.77	0.18	0.02	0.02	0.02	0.02	0.33	0.33	0.31	0.0013	0.0013	0	0
FWP1	Firewater Pump	28.55429	95.02771	21	6.096	746	72.85	0.16	0.02	0.0003	0.02	0.0003	0.003	0.003	0.25	0.0005	0.0000	0	0
SPM 1 - LOADING																			
CAE1	Carrier Aux Diesel Gen Engines	28.541554	94.996868	0	57.912	589	46.33	1.00	0.22	0.18	0.21	0.18	8.99	7.49	2.99	0.38	0.31	0	0
CB	Carrier Boiler	28.541554	94.996868	0	57.912	589	46.33	1.00	0.53	0.01	0.53	0.01	3.86	0.08	0.80	2.28	0.05	0	0
ET1	Escort Tug	28.539742	94.99321	0	10.668	728	76.20	0.37	0.39	0.27	0.38	0.26	12.49	8.67	5.32	0.67	0.47	0	0
SPM 2 - TRANSITTING																			
CME2	Carrier Main Engine	28.540999	94.996172	0	57.912	589	46.33	1.00	1.93	0.27	1.78	0.25	51.00	7.08	4.62	1.10	0.15	0	0
CAE2	Carrier Aux Diesel Gen Engines	28.524141	95.028175	0	57.912	589	46.33	1.00	0.22	0.18	0.21	0.18	8.99	7.49	2.99	0.38	0.31	0	0
SSB	Service Support Boat	28.520443	95.026386	0	10.668	728	15.24	0.37	0.15	0.05	0.15	0.05	3.20	1.09	2.49	0.21	0.07	0	0
LHB	Line Hose Boat	28.540651	95.019298	0	10.668	728	15.24	0.37	0.06	0.02	0.06	0.02	1.20	0.42	0.93	0.08	0.03	0	0

[1] Based on base elevation designation.

3.0 METHODOLOGY

3.1 OCD Model

Dispersion modeling was performed using the Offshore and Coastal Dispersion (OCD) model (Version 5.0, November 1997). This model simulates effects of offshore emissions from point, area, or line sources on the air quality of coastal regions and is preferred for analyzing over-water pollutant transport. The OCD Model is the preferred model by the US EPA for performing PSD-related modeling for offshore stationary sources.

Averaging periods for each of the pollutants modeled, along with the pollutant's PSD significance level, monitoring exemption level, increment consumption standard, and National Ambient Air Quality Standard (NAAQS) are shown in Table 3-1.

Table 3-1: PSD Significance, Monitoring De Minimis, Increment Consumption, and NAAQS

Averaging Period	$PM_{2.5}$ (ug/m^3)	PM_{10} (ug/m^3)	NO_2 (ug/m^3)	SO_2 (ug/m^3)	CO (ug/m^3)
	Significance Level				
Annual	0.2	1	1	1	---
24-hour	1.2	5	---	5	---
8-hour	---	---	---	---	500
3-hour	---	---	---	25	---
1-hour	---	---	7.5	7.8	2,000
	Monitoring De Minimis Concentration				
Annual	---	---	14	---	---
24-hour	0 [1]	10	---	13	---
8-hour	---	---	---	---	575
1-hour	---	---	---	---	---
	Increment Consumption Standard				
Annual	4	17	25	20	---
24-hour	9	30	---	91	---
8-hour	---	---	---	---	---
3-hour	---	---	---	512	----
1-hour	---	---	---	---	----
	NAAQS				
Annual	12	---	100	80	---
24-hour	35	150	---	365	---
8-hour	---	---	---	---	10,000
3-hour	---	---	---	1300	---
1-hour	---	---	188	196	40,000

[1] The Monitoring De Minimis Concentration for $PM_{2.5}$ 24-hour averaging period was vacated in January 2013.

3.2 Meteorological Data

The OCD model requires both over-land and over-water meteorological data. The following meteorological dataset has been preprocessed by BOEM in accordance with the Five-*Year Meteorological Datasets for CALMET/CALPUFF and OCD5 Modeling of the Gulf of Mexico Region*[3] and used in the modeling analysis:

- OCD Group: 3a (i.e., northeastern portion of the Texas Gulf Coast)
- Buoy: 42035
- Surface data: Port Arthur National Weather Service (NWS) Station
- Upper-air data: Lake Charles NWS Station

This dataset was chosen based on the proximity of the surface stations. The proposed Project will be located nearer the Port Arthur, TX station than the Corpus Christi, TX station. The dataset includes buoy, onshore surface, and onshore upper-air sites pre-processed for OCD5 meteorological input data files. For the modeling analyses, five consecutive years of meteorological data, from 2000-2004, were used.

3.3 Receptor Grid

A receptor grid was developed with a starting point for the receptors located at the ambient air boundary. The ambient air boundary for TGL is defined as the Area-to-be-Avoided (ATBA). Surrounding the platform and VLCCs on each SPM will be safety zones (for a total of three zones) to exclude and restrict non-project vessel operations. The outline of each of the three safety zones is identified as the ATBA. These non-project vessels will not be allowed to anchor within the safety zone/ABA boundary. The established safety zone/ATBA will be monitored via the port control center, vessel traffic control, and port support vessels.

Discrete receptors were placed at 100-meter intervals along the facility's ambient air boundary as described above. Additional receptors were placed at 500-meter intervals from the fence line out to five kilometers. This receptor grid is sufficient to identify the location of the maximum off-property concentration for each modeled pollutant.

3.4 Terrain

The proposed Texas GulfLink Deepwater Port facility stationary emissions source will be located approximately 30 nautical miles off the coast of Texas in the Gulf of Mexico. Receptors are located over water surrounding the offshore facility. Therefore, the entire modeling domain is located completely over water in the Gulf of Mexico. According to US EPA and BOEM modeling guidance, overwater and shoreline is considered flat terrain. Therefore, the elevations for receptors were set to zero height for the modeling analysis.

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[3] Five-Year Meteorological Datasets for CALMET/CALPUFF and OCD5 Modeling of the Gulf of Mexico Region, OCS Study, MMS 2008-029, New Orleans, July 2008.

3.5 Building Downwash

Building downwash accounts for the effects of nearby structures on the flow of emissions from their respective release structures. For this modeling analysis, typical platform building heights and dimensions were input. Base elevations for the platform's buildings were assumed the height of the platform above the water.

4.0 SIGNIFICANT IMPACT ANALYSIS

Screening runs were conducted to determine whether the net emission increase of each pollutant could cause a significant impact and whether pre-construction monitoring would be required. Appendix A contains the electronic modeling files generated for these analyses.

In the significant impact analysis, the project emissions of NO_x, CO, PM_{10}/$PM_{2.5}$, and SO_2 were evaluated to determine whether they have the potential for a significant impact. The project emissions for each pollutant and applicable averaging period were modeled and compared to the pollutant's defined significant impact level (SIL).

The US Court of Appeals decided to vacate and remand 40 CFR 51.166(k)(2) based on the US EPA's lack of authority to exempt sources from the requirements of the Federal Clean Air Act when it established SILs for $PM_{2.5}$. Therefore, an analysis was conducted to justify the use of the SILs in the screening analysis. This analysis was based on comparing the difference between the NAAQS and the measured background concentrations to the SIL. If the difference between the NAAQS and the background concentration is greater than the SIL, it is concluded that the SIL is acceptable to be used to determine if a cumulative impact analysis is necessary. The analysis is as follows:

Table 4-1: $PM_{2.5}$ SIL Justification

$PM_{2.5}$ Averaging Period	NAAQS (ug/m^3)	Galveston Monitor 48-167-1034 Average 2016 through 2018 (ug/m^3)	Difference (NAAQS – Monitor) (ug/m^3)	$PM_{2.5}$ SIL (ug/m^3)	Greater Than SIL?
24-Hour	35	21.7	13.3	1.2	Yes
Annual	12	7.2	4.8	0.3	Yes

Per US EPA guidance, all predicted impacts for annual NO_2, PM_{10}/$PM_{2.5}$, and SO_2 are reported as the high-first-high of the modeled concentrations predicted each year at each receptor based on five years of National Weather Service (NWS) overland meteorological data and buoy overwater meteorological data.

Per US EPA guidance, in the screening analysis, predicted impacts for 1-hour NO_2, 24-hour $PM_{2.5}$, and 1-hour SO_2 are reported as the highest of the five-year averages of the maximum modeled concentrations predicted each year at each receptor based on five years of meteorological data. While the NAAQS for annual PM_{10} has been revoked, the annual PM_{10} PSD increment standard remains in effect. Therefore, a comparison to the SIL for annual PM_{10} was performed to determine if an annual PM_{10} PSD increment analysis is required.

For the remaining pollutants/averaging time combinations (i.e., CO 1-hour and 8-hour, PM_{10} 24-hour, and SO_2 3-hour and 24-hour), predicted impacts are reported as the high-first-high of the modeled concentrations predicted each year at each receptor based on five years of meteorological data.

As part of the assessment of off-site impacts from $PM_{2.5}$, secondary formation of $PM_{2.5}$ attributed to emissions of SO_2 and NO_x must be addressed. The US EPA has developed a method to estimate single source impacts of secondary pollutants as a Tier 1 approach. This assessment is contained in the US EPA's guidance document for using the Modeled Emission Rates for Precursors (MERPs) approach.[4] As described in more detail in Section 6.0 of this report, the guidance uses existing empirical relationships between precursors and secondary impacts. A MERP is defined as an emission rate of a precursor that is expected to result in a change in the ambient ozone or $PM_{2.5}$ that would be less than a specific air quality concentration threshold for ozone or $PM_{2.5}$. MERPs for each precursor may be based on either the most conservative (lowest) values across a region/area or the source-specific value derived from a more similar hypothetical source modeled by a permit applicant, permitting authority, or US EPA.

4.1 Preconstruction Monitoring De Minimis Levels

The results of the preliminary analysis were compared to the preconstruction monitoring exemption levels. As described in the following paragraphs and tables, the results indicated no concentrations equal to or greater than the monitoring exemption level for any modeled pollutant with a preconstruction monitoring exemption concentration

The significant monitoring concentration level for the 24-hour averaging period for $PM_{2.5}$ was vacated in January 2013, essentially establishing the level as zero. As a result, $PM_{2.5}$ data from the US EPA Galveston monitoring station was used to address the preconstruction monitoring requirements.

4.2 Carbon Monoxide (CO) Modeling

The maximum concentrations predicted by the screening modeling runs for CO are shown in Table 4-2. The modeling results indicate that the maximum offsite concentrations of CO were below the respective PSD modeling significant impact levels and preconstruction monitoring exemption levels. Therefore, a cumulative impact analysis for CO was not required.

[4] *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ Under the PSD Permitting Program* (EPA-454/R-16-006, December 2016).

Table 4-2: Screening Analysis Results for CO

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration (ug/m^3)	Significant Impact Level (ug/m^3)	Monitoring Exemption Level (8-hour) (ug/m^3)
CO	2000	1-Hour	162	2,000	NA
CO	2001	1-Hour	179	2,000	NA
CO	2002	1-Hour	173	2,000	NA
CO	2003	1-Hour	172	2,000	NA
CO	2004	1-Hour	165	2,000	NA
CO	2000	8- Hour	59	500	575
CO	2001	8- Hour	67	500	575
CO	2002	8- Hour	96	500	575
CO	2003	8- Hour	64	500	575
CO	2004	8- Hour	70	500	575

4.3 Nitrogen Dioxide (NO_2) Modeling

The maximum concentrations predicted by the screening modeling runs for NO_2 are shown in Table 4-3. The modeling results for the 1-hour NO_2 and annual averaging periods indicate that the maximum off-site concentrations were above the PSD modeling significant impact level for each averaging period. Therefore, a cumulative impact analysis for NO_2 was required.

Results of the annual averaging period are below the monitoring exemption level. Therefore, preconstruction monitoring is not required for NO_2 based on its annual averaging period.

Table 4-3: Screening Analysis Results for NO_2

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration (ug/m^3)	Significance Impact Level (ug/m^3)	Monitoring Exemption Level (ug/m^3)
NO_2	2000 - 2004	1-Hour 5-Year Avg	261.77	7.5	NA
NO_2	2000	1-Hour	262.19		
NO_2	2001	1-Hour	264.69		
NO_2	2002	1-Hour	261.22		
NO_2	2003	1-Hour	257.64		
NO_2	2004	1-Hour	263.10		
NO_2	2000	Annual	3.69	1	14
NO_2	2001	Annual	3.18	1	14
NO_2	2002	Annual	3.40	1	14
NO_2	2003	Annual	3.58	1	14
NO_2	2004	Annual	4.27	1	14

4.4 Particulate Matter (less than 10 microns) (PM_{10}) Modeling

The maximum concentrations predicted by the screening modeling runs for PM_{10} are shown in Table 4-4. The modeling results for both PM_{10} averaging periods, 24-hour and annual, indicate that the maximum off-site concentrations are below the PSD modeling significant impact levels. Therefore, a cumulative impact analysis was not required for these averaging periods. In addition, results of the PM_{10} screening analysis showed no exceedances of the monitoring exemption level for the 24-hour averaging period. As such, a preconstruction monitoring analysis was not required for this pollutant.

Table 4-4: Screening Analysis Results for PM_{10}

Pollutant	**Meteorological Year**	**Averaging Period**	**Modeled Concentration** (ug/m^3)	**Significance Impact Level** (ug/m^3)	**Monitoring Exemption Level (24-hour)** (ug/m^3)
PM_{10}	2000	24-Hour	2.48	5	10
PM_{10}	2001	24-Hour	3.07	5	10
PM_{10}	2002	24-Hour	2.48	5	10
PM_{10}	2003	24-Hour	2.66	5	10
PM_{10}	2004	24-Hour	2.43	5	10
PM_{10}	2000	Annual	0.18	1	NA
PM_{10}	2001	Annual	0.25	1	NA
PM_{10}	2002	Annual	0.21	1	NA
PM_{10}	2003	Annual	0.22	1	NA
PM_{10}	2004	Annual	0.20	1	NA

4.5 Particulate Matter (less than 2.5 microns) ($PM_{2.5}$) Modeling

The maximum concentrations predicted by the screening modeling runs for $PM_{2.5}$ are shown in Table 4-5. The modeling results for the $PM_{2.5}$ annual averaging period indicate that the maximum off-site concentrations are below the PSD modeling significant impact level. Therefore, a cumulative impact analysis is not required for this averaging period. However, the modeling results for the 24-hour $PM_{2.5}$ averaging period indicate that the maximum off-site concentrations were above the PSD modeling significant impact level. Therefore, a cumulative impact analysis for $PM_{2.5}$ 24-hour was required.

Table 4-5: Screening Analysis Results for $PM_{2.5}$

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration (ug/m^3)	Significance Impact Level (ug/m^3)	Monitoring Exemption Level (24-hour) (ug/m^3)
$PM_{2.5}$	2000	24-Hour	2.48	1.2	NA
$PM_{2.5}$	2001	24-Hour	3.07	1.2	NA
$PM_{2.5}$	2002	24-Hour	2.48	1.2	NA
$PM_{2.5}$	2003	24-Hour	2.66	1.2	NA
$PM_{2.5}$	2004	24-Hour	2.43	1.2	NA
$PM_{2.5}$ 5-year Avg	2000-2004	24-Hour	2.62	1.2	NA
$PM_{2.5}$	2000	Annual	0.11	0.2	NA
$PM_{2.5}$	2001	Annual	0.10	0.2	NA
$PM_{2.5}$	2002	Annual	0.10	0.2	NA
$PM_{2.5}$	2003	Annual	0.11	0.2	NA
$PM_{2.5}$	2004	Annual	0.13	0.2	NA
$PM_{2.5}$ 5-year Avg	2000-2004	Annual	0.11	0.2	NA

4.6 Sulfur Dioxide (SO_2) Modeling

The maximum concentrations predicted by the screening modeling runs for SO_2 are shown in Table 4-6. The modeling results indicate that the maximum off-site concentrations of SO_2 were below the respective PSD modeling significant impact levels and preconstruction monitoring exemption levels for all averaging periods except the 1-hour average. Therefore, a cumulative impact analysis for SO_2 3-hour, 24-hour, and annual was not required. The modeling results for the 1-hour SO_2 averaging period indicates that the maximum off-site concentrations were above the PSD modeling significant impact level. Therefore, a cumulative impact analysis for SO_2 was required.

Table 4-6: Screening Analysis Results for SO_2

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration (ug/m^3)	Significant Impact Level (ug/m^3)	Monitoring Exemption Level (ug/m^3)
SO_2	2000	1-Hour	14.07	7.8	NA
SO_2	2001	1-Hour	14.45	7.8	NA
SO_2	2002	1-Hour	14.03	7.8	NA
SO_2	2003	1-Hour	13.96	7.8	NA
SO_2	2004	1-Hour	14.14	7.8	NA

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration (ug/m^3)	Significant Impact Level (ug/m^3)	Monitoring Exemption Level (ug/m^3)
SO_2	2000	3- Hour	9.79	25	NA
SO_2	2001	3- Hour	10.71	25	NA
SO_2	2002	3- Hour	10.71	25	NA
SO_2	2003	3- Hour	11.3	25	NA
SO_2	2004	3- Hour	10.97	25	NA
SO_2	2000	24-Hour	3.39	5	13
SO_2	2001	24-Hour	4.36	5	13
SO_2	2002	24-Hour	3.46	5	13
SO_2	2003	24-Hour	4.35	5	13
SO_2	2004	24-Hour	4.11	5	13
SO_2	2000	Annual	0.30	1	NA
SO_2	2001	Annual	0.35	1	NA
SO_2	2002	Annual	0.29	1	NA
SO_2	2003	Annual	0.31	1	NA
SO_2	2004	Annual	0.33	1	NA

5.0 CUMULATIVE IMPACT ANALYSIS

The intent of the cumulative impact analysis is to determine if the proposed project causes or contributes to a violation of either the NAAQS or PSD Increment Consumption standards. For the pollutant/averaging periods requiring a NAAQS analysis, the form of the standard is given in the table below:

Table 5-1: Form of NAAQS Analysis

Pollutant	Averaging Period	Form of the NAAQS
$PM_{2.5}$	24-Hour	98^{th} Percentile averaged over 3 years
SO_2	1-Hour	99^{th} Percentile of the 1-hour daily maximum concentrations, averaged over 3 years
NO_2	1-Hour	98^{th} Percentile of the 1-hour daily maximum concentrations, averaged over 3 years
	Annual	Annual Mean

The OCD model does not have the capability of calculating the 98-percentile of the 1-hour daily maximum concentrations of NO_2. Therefore, a post-processor program was written to calculate these values from the 1-hour OCD model results. In addition, the Ambient Air Ratio (ARM) of 0.8 was applied to the results of the 1-hour NO_2 concentrations for the cumulative analysis to account for the conversion of NO_x to NO_2. As a conservative measure, for the results of the annual NOx cumulative analysis, a Tier 1 full conversion of NO_x to NO_2 was assumed. In addition, for the results of the 24-hour $PM_{2.5}$ and the 1-hour SO_2 cumulative analyses, the high-first-high concentrations, plus background, were compared to the NAAQS and Increment Consumption Standards, as applicable. Appendix A contains the electronic modeling files for these analyses.

5.1 Emissions Sources

Off-site emission sources for the cumulative impact analyses were included in the model for the NAAQS and increment consumption analysis. Sources within 50 kilometers of the facility were included for the NO_2, SO_2 and $PM_{2.5}$ analyses and were obtained from the 2014 BOEM Gulf-wide Emission Inventory. Table 5-2 lists the off-site sources included in the model.

Table 5-2: Off-Site Sources for Cumulative Impact Analyses

Source ID	Source Description	Latitude Decimal Degrees	Longitude Decimal Degrees	Base Elevation (m)	Stack Height Above Platform or Water (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)	$PM_{2.5}$ Emissions 24-hr (g/s)	NO_2 Emissions 1-hr (g/s)	NO_2 Emissions Annual (g/s)	SO_2 Emissions 1-hr (g/s)
2222_1	Boiler - Max MMBTU/hr < 10-natural gas	28.15999985	94.73999786	0	24.38	478	2.81	0.30	0.0003	0.0054	0.0052	0.00003
2222_2	Diesel Engine – Max HP < 600-diesel	28.15999985	94.73999786	0	24.38	755	11.01	0.15	0.0193	0.2741	0.0008	0.018
2222_3	Natural Gas Engine - 4-stroke, rich	28.15999985	94.73999786	0	24.38	866	18.35	0.15	0.0031	0.4054	0.2460	0.0001
2428	Diesel Engine – Max HP < 600-diesel	28.19000053	94.76000214	0	24.38	755	11.01	0.15	0.0193	0.2741	0.0003	0.018
2222_1	Boiler - Max MMBTU/hr < 10-natural gas	28.15999985	94.73999786	0	24.38	478	2.81	0.30	0.0003	0.0054	0.0052	0.00003

5.2 NAAQS Comparison

Maximum hourly potential-to-emit (PTE) emission rates were modeled for comparison with short-term averaging periods. In addition to the permitted inventory of emission sources, background concentrations from a representative monitor were entered into the model to determine total pollutant concentrations for comparison to the NAAQS.

Ambient air concentrations were obtained from the monitoring stations as shown below in Table 5-3. The resulting concentration from the modeling runs were compared to the NAAQS for each averaging period. If the modeled concentration plus background was equal to or greater than the NAAQS, a culpability analysis was performed to determine the facility's contribution to the exceedance.

Table 5-3: Ambient Air Quality Monitoring Sites

Pollutant	Name of Monitoring Site	AQS Code
$PM_{2.5}$	Galveston	48-167-1034
NO_2	Lake Jackson	48-039-1016
O_3	Lake Jackson	48-039-1016
SO_2	Texas City Ball Park	48-167-0005

5.3 Increment Consumption Analysis

The pollutant/averaging period combinations exceeding the SIL which have Increment Consumption Standards are as follows:

- NO_2 annual average
- $PM_{2.5}$ 24-hour average

For both the $PM_{2.5}$ and NO_2 increment consumption analysis, the NAAQS inventory was used as a Tier 1 conservative approach, which included permitted allowable emissions instead of actuals without subtracting baseline emissions.

5.4 Background Air Quality Data

Monitoring data was used to establish background concentrations required for the NAAQS analysis. Site-specific ambient air monitoring data were not available. Therefore, US EPA's AirData system was used to obtain background ambient concentrations of affected pollutants. This data was taken from the US EPA monitoring data website at: https://www.epa.gov/air-data. Because a cumulative impact analysis was required for NO_2 (1-hour and annual averages), existing monitoring data from the Lake Jackson, TX air monitoring facility was used. For the $PM_{2.5}$ and SO_2 cumulative impact analyses, the Galveston and Texas City Ball Park monitors, respectively, were used. Ozone background concentrations, which were used in the Ozone Impacts Analysis described in Section 8.0 of this report, were also derived from the Lake Jackson monitor.

The monitors chosen were reviewed for sufficient data to meet the completeness criteria. A year meets the completeness criteria if at least 75% of the scheduled samples per quarter were reported. The most recent three consecutive available years, 2016 through 2018, were analyzed. The 2018 $PM_{2.5}$ Galveston monitoring data contained a quarter less than 75% complete. Therefore, the years of 2015 – 2017 were analyzed for completeness and utilized. The 2017 SO_2 Texas City Ball Park monitoring data contained a quarter less than 75% complete. Therefore, the years of 2014 – 2016 were analyzed for completeness and utilized. Information on the monitoring station used is shown in Table 5-4 below.

Per the TCEQ Guidelines, "The purpose of the representative background monitoring concentrations is to account for sources not explicitly modeled in an air dispersion modeling analysis." As the proposed project is located approximately 28 nautical miles off the Texas coast, the available monitors in and near Galveston, TX were considered for use. An evaluation of the monitors chosen was conducted to ensure that each monitor resulted in a conservative selection for use as background concentration data. Because the proposed site is located in open waters with only two known nearby platforms to exist, each approximately 50 kilometers (approximately 31 miles) away, any monitor with some level of commercial or industrial contribution of the monitored pollutant would be conservative to apply as background in this modeling analysis.

The nearest monitor with NO_2 data to the proposed offshore facility is Lake Jackson (AQS Site ID: 48-039-1016) in Brazoria County, TX. This station is located west of the city of Lake Jackson and northwest of the city of Freeport. The Lake Jackson monitor location is adjacent to Highway 2004 near the intersection of Highway 332. This monitor is also within a half mile of a large commercial shopping area and approximately 1 mile from the Nolan Ryan Expressway (Hwy 288), which is a heavily traveled thoroughfare between Houston and Freeport. The influences of these nearby highways and population centers to the Lake Jackson monitor are considered relatively much greater than the influences to the proposed Texas GulfLink facility of the 2 platforms located over 30 miles from the facility. Therefore, use of concentration data from the Lake Jackson monitor for the project offshore modeling is deemed conservative and appropriate.

The nearest monitor to the proposed facility with $PM_{2.5}$ data is located in Galveston, TX (AQS Site ID: 48-167-1034) in Galveston County. This station is located on Galveston Island just south of Runway 36 at the Scholes International Airport. Numerous additional commercial and residential influences exist surrounding the monitor location. These influences to the Galveston monitor are considered much greater than the influences to the proposed Texas GulfLink facility from the 2 platforms located over 30 miles from the proposed facility. Therefore, use of concentration data from the Galveston monitor is deemed conservative and appropriate.

The nearest monitor to the proposed facility with SO_2 data is Texas City Ball Park (AQS Site ID: 48-167-0005) in Galveston County. This station is located in Texas City, TX approximately a quarter mile north of a heavily industrialized area mainly consisting of chemical and petroleum production operations and product tankage. This nearby industry is considered to have much greater influences on the Texas City Ball Park monitor than influences to the proposed Texas GulfLink facility from the 2 platforms located over 30 miles away from the proposed facility. Therefore, use of concentration data from the Texas City Ball Park monitor is deemed conservative and appropriate.

Table 5-4: Monitoring Data

Compound	Monitor Name	AQS Code	Year	Percent Valid Data				Value Rank	Concentration (ppb)	Concentration (µg/m³)	3-Year Average Concentration (µg/m³)
				Q1	Q2	Q3	Q4				
$PM_{2.5}$	Galveston	48-167-1034	2015	93%	79%	99%	100%	98th Percentile 24-Hour		22.5	21.67
			2016	100%	99%	100%	87%			19.3	
			2017	93%	100%	86%	100%			23.2	
NO_2	Lake Jackson	48-039-1016	2016	93%	90%	94%	94%	98th Percentile 1-Hour	19	35.8	35.2
			2017	94%	96%	80%	91%		18.9	35.6	
			2018	96%	94%	95%	82%		18.2	34.2	
O_3	Lake Jackson	48-039-1016	2016	97%	99%	100%	95%	99th Percentile 8-Hour	66	130	66 [1]
			2017	98%	99%	83%	98%		65	128	
			2018	99%	99%	99%	99%		68	133	
SO_2	Texas City Ball Park	48-167-0005	2014	99%	95%	97%	96%	99th Percentile 1-Hour	16	41.9	59.2
			2015	97%	98%	98%	98%		29.1	76.2	
			2016	98%	98%	98%	98%		22.7	59.4	

[1] parts per billion (ppb)

5.5 NO_2 NAAQS Comparison

The results of the 1-hour NO_2 NAAQS analysis, which includes the background NO_2 concentration, are shown in Table 5-5 below:

Table 5-5: NAAQS for NO_2 1-Hour Standard

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration Max Daily 8th High All Sources (ug/m³)	Background Concentration (ug/m³)	Total Concentration (ug/m³)	NO_2 NAAQS Standard 1-Hour (ug/m³)
NO_2	2000 - 2004	1-Hour 5-Year Avg	140.54	35.2	175.74	188
NO_2	2000	1-Hour	136.6			
NO_2	2001	1-Hour	139.79			
NO_2	2002	1-Hour	139.92			
NO_2	2003	1-Hour	146.63			
NO_2	2004	1-Hour	139.74			

The results of the annual NO_2 NAAQS, which includes the background NO_2 concentration, are shown in Table 5-6 below:

Table 5-6: NAAQS for NO_2 Annual Standard

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration Annual Average All Sources (ug/m³)	Background Concentration (ug/m³)	Total Concentration (ug/m³)	NO_2 NAAQS Standard Annual (ug/m³)
NO_2	2000	Annual	3.70	3.84	7.54	100
NO_2	2001	Annual	3.19		7.03	
NO_2	2002	Annual	3.41		7.25	
NO_2	2003	Annual	3.59		7.43	
NO_2	2004	Annual	4.27		8.11	

5.6 $PM_{2.5}$ NAAQS Comparison

The results of the 24-hour NAAQS which includes the background $PM_{2.5}$ concentration are shown in Table 5-7 below:

Table 5-7: NAAQS for $PM_{2.5}$ 24-Hour Standard

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration High-First-High All Sources (ug/m^3)	Background Concentration (ug/m^3)	Total Concentration (ug/m^3)	$PM_{2.5}$ NAAQS Standard 24-Hour (ug/m^3)
PM_{25}	2000 - 2004	24-Hour 5-Year Avg	2.62	21.67	24.29	35
PM_{25}	2000	24-Hour	2.48			
PM_{25}	2001	24-Hour	3.07			
PM_{25}	2002	24-Hour	2.48			
PM_{25}	2003	24-Hour	2.66			
PM_{25}	2004	24-Hour	2.43			

Secondary $PM_{2.5}$ formation as it relates to the results above are discussed in detail in Section 6.0. The results indicated no exceedance of the 24-hour $PM_{2.5}$ NAAQS and, therefore, the proposed project has demonstrated compliance with the $PM_{2.5}$ NAAQS.

5.7 SO_2 NAAQS Comparison

The results of the 1-hour SO_2 NAAQS, which includes the background SO_2 concentration, are shown in Table 5-8 below:

Table 5-8: NAAQS for SO_2 1-Hour Standard

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration High-First-High All Sources (ug/m^3)	Background Concentration (ug/m^3)	Total Concentration (ug/m^3)	SO_2 NAAQS Standard 1-Hour (ug/m^3)
SO_2	2000 - 2004	1-Hour 5-Year Avg	14.13	59.2	73.33	196
SO_2	2000	1-Hour	14.07			
SO_2	2001	1-Hour	14.45			
SO_2	2002	1-Hour	14.03			
SO_2	2003	1-Hour	13.96			
SO_2	2004	1-Hour	14.14			

5.8 $PM_{2.5}$ Increment Consumption Comparison

The results of the 24-hour $PM_{2.5}$ increment consumption analysis, as shown in Table 5-9, demonstrate compliance with the increment consumption standard.

Table 5-9: Increment Consumption for $PM_{2.5}$ 24-Hour Standard

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration 24-Hour Average High-First-High (ug/m^3)	Increment Consumption Standard $PM_{2.5}$ (ug/m^3)
$PM_{2.5}$	2000	24-Hour	2.48	9
$PM_{2.5}$	2001	24-Hour	3.07	9
$PM_{2.5}$	2002	24-Hour	2.48	9
$PM_{2.5}$	2003	24-Hour	2.66	9
$PM_{2.5}$	2004	24-Hour	2.43	9

Secondary $PM_{2.5}$ formation as it relates to the results above are discussed in detail in Section 6.0. The results indicated no exceedance of the 24-hour $PM_{2.5}$ Increment Consumption standard, and therefore, the proposed project has demonstrated compliance with the $PM_{2.5}$ Increment Consumption.

6.0 $PM_{2.5}$ SECONDARY FORMATION

As part of the assessment of off-site impacts from $PM_{2.5}$, secondary formation of $PM_{2.5}$ attributed to emissions of SO_2 and NO_x must be addressed. As previously described, the US EPA has developed a method to estimate single source impacts of secondary pollutants as a Tier 1 approach. This assessment is contained in the previously referenced US EPA's guidance document on modeling using the MERPs approach. The guidance uses existing empirical relationships between precursors and secondary impacts. A MERP is defined as an emission rate of a precursor that is expected to result in a change in the ambient ozone or $PM_{2.5}$ that would be less than a specific air quality concentration threshold for ozone or $PM_{2.5}$. MERPs for each precursor may be based on either the most conservative (lowest) values across a region/area or the source-specific value derived from a more similar hypothetical source modeled by a permit applicant, permitting authority, or US EPA.

For the $PM_{2.5}$ 24-hour precursor assessment, only NO_x emissions are above the level of the significant emission rate requiring a PSD compliance demonstration. The proposed annual NO_x (expressed as NO_2) emissions from the project, 961.74 tons per year (TPY), were compared to Table 7.1 of the guidance document, *Table 7.1 Most Conservative (lowest) Illustrative MERP Values (tons per year) by Precursor, Pollutant and Region.* For the Central US, the lowest NO_x MERP for daily PM is 1,820 TPY. The NO_x emissions from the proposed Texas GulfLink Project are below this value. Therefore, air quality impacts of $PM_{2.5}$ from NO_x would be expected to be below the critical air quality concentration (CAC) threshold.

In addition, calculating a source-specific value derived from a more similar hypothetical source modeled by EPA results in an even lower value as shown below:

> Hypothetical source for NO_x – (Central US, Source 20, elevated, 1,000 TPY, FIPS 48201). This source is located in Harris County, Texas.
>
> MERP = 1.2 ug/m^3 * (1,000 TPY / 0.09) = 11,111 TPY
>
> Percentage of MERP = (961.74 TPY NO_x / 11,111 TPY MERP) = 8.7% of MERP

Proposed TGL DWP NO_x emissions are 8.7% of the MERP. Adding 8.7% to the maximum concentration calculated in the NAAQS analysis for 24-hour $PM_{2.5}$ of 2.62 ug/m^3 would not cause an exceedance of the NAAQS. Additionally, adding 8.7% to the maximum concentration calculated in the Increment Consumption analysis for 24-hour $PM_{2.5}$ of 3.07 ug/m^3 would not cause an exceedance of the Increment Consumption Standard.

For the $PM_{2.5}$ annual precursor assessment, the proposed NO_x emissions from the project in TPY were compared to Table 7.1 of the aforementioned guidance document, *Table 7.1 Most Conservative (lowest) Illustrative MERP Values (tons per year) by Precursor, Pollutant and Region.* For the Central US, the lowest NO_x MERP for annual PM is 7,427 TPY. The NO_x emissions from the Project are well below this value. Therefore, air quality impacts of $PM_{2.5}$ from NO_x would be expected to be below the CAC threshold. Proposed TGL DWP NO_x emissions are 13% of the MERP. Adding 13% to the maximum concentration calculated in the significant impact analysis model for annual $PM_{2.5}$ of 0.11 ug/m^3 would not cause an exceedance of the SIL.

This analysis demonstrates that the total $PM_{2.5}$ impacts (primary and precursor) are below the CAC.

7.0 VISIBILITY IMPAREMENT ANALYSIS

The US EPA's workbook on visual impact screening[5] provides guidance for conducting impairment analysis using the US EPA VISCREEN model. A visibility analysis was conducted using US EPA's VISCREEN model on the nearest Class II area, which is the San Bernard National Wildlife Refuge. This area is approximately 68 kilometers from the proposed Texas GulfLink Project.

A Level 1 analysis was conducted using the Project's potential tons per year (TPY) emission rate for particulate matter ($PM_{10/2.5}$) and nitrogen oxides (NO_x) that could occur simultaneously. Based on regulatory guidance related to Level 1 analysis, all default options in the model were used. Level 1 screening is designed to provide a conservative estimate of plume visual impacts based on worst-case meteorological conditions: stable atmosphere ("F" Stability), wind speed of 1 meter per second (m/s) persisting for 12 hours, with a wind that would transport the plume directly adjacent to the observer.

The results of this conservative Level 1 analysis are that the maximum visual impacts meet the screening criteria. The VISCREEN results are included as Appendix B to this modeling report.

[5] Workbook for Plume Visual Impact Screening and Analysis (Revised), EPA-454/R-92-023, October 1992.

8.0 OZONE IMPACT ANALYSIS

Because VOC and NO_x are precursors to ground-level ozone formation, an ozone impacts analysis was conducted to demonstrate that the proposed Project's NO_x and VOC emissions will not cause a significant increase in ozone levels in the area. A Tier 1 MERP analysis was conducted using the US EPA's guidelines for MERPs, EPA-454/ R-16-006, December 2016 (see Footnote 4 in Section 4.0 above).

NO_x Assessment

A source-specific value derived from a similar hypothetical source modeled by US EPA was determined for potential ozone formation due to Project NO_x as shown below. The critical air quality concentration (CAC) used was the difference between the ozone design value and the 3-year average monitoring data from the Lake Jackson monitor:

Proposed Project Emissions: NO_x – 98.33 TPY

Hypothetical source for NO_x – Central US, Source 20, elevated, 500 TPY, FIPS 48201. This source is located in Harris County, Texas.

MERP = 4.0 ppb * (500 TPY/0.78) = **2,564 TPY**

Note that the NO_x emissions described above do not include secondary emissions from tankers and support vessels.

VOC Assessment

A source-specific value derived from a similar hypothetical source modeled by US EPA was determined for potential ozone formation due to Project VOC as shown below. The CAC used was the difference between the ozone design value and the 3-year average monitoring data from the Lake Jackson monitor:

Proposed Project Emissions: VOC – 9,685.53 TPY

Hypothetical source for VOC – Central US, Source 20, elevated, 3,000 TPY, FIPS 42801. This source is located in Harris County, Texas.

MERP = 4.0 ppb * (3,000 TPY/1.09) = **11,009 TPY**

Note that the VOC emissions described above do not include secondary emissions from tankers and support vessels.

In addition, the VOC and NO_x precursor contributions to ozone are considered together to determine if the Project's air quality impact of ozone would exceed the critical air quality threshold. This analysis is shown below:

Cumulative Impacts for Ozone:

(98.33 TPY NO_x/2,564 TPY MERP) + (9,685.53 TPY VOC/11,009 TPY MERP) = 91.8% of MERP

Results indicate that the proposed precursor emissions from the project are less than 100% indicating that the CAC threshold would not be exceeded when considering the additive impacts of these precursors.

9.0 CLASS I AREA IMPACT ANALYSIS

There are no Class I areas located within 500 kilometers of the proposed Texas GulfLink offshore Deepwater Port facility. The nearest Class I area, Breton National Wildlife Refuge, is located approximately 570 kilometers to the east. Therefore, no Class I analysis was conducted. Given the distance between Breton National Wildlife Refuge and the Project, no Class I increment analysis was conducted.

10.0 STATE PROPERTY LINE ANALYSIS

To meet the requirements of the Deepwater Act (i.e., for nearest adjacent coastal state), a TCEQ State Property Line Analysis was conducted for the proposed offshore facility for applicable sulfur compounds. Hydrogen Sulfide was reviewed and, given its negligible maximum hourly emission rate (0.12 lb/hr), a modeling analysis was not performed.

Because the NAAQS analyses described in Section 5.0 of this report utilized the High-First-High SO_2 results, those results are appropriate for comparison with the State Property Line Standards. One year of meteorological data (most recent year 2004) was used for comparison. Modeling for SO_2 at the Deepwater Port Facility indicates that results will remain well below the State Property Line Standard.

Table 10-1: State Property Line SO_2 Results

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration (ug/m^3)	State Property Line Standard (ug/m^3) [2]
SO_2	2004	30-minute[1]	14.14	1,021

[1] Per TCEQ guidance, use the high first high predicted concentrations for the one hour averaging times.

[2] State property line standard from TCEQ Air Quality Modeling Guidelines (APDG 6232 v4, revised 9/2018), Appendix B Table B-3.

11.0 HEALTH EFFECTS ANALYSIS

The pollutant evaluated in this analysis is defined by TCEQ as "crude oil with a benzene concentration of less than 1 percent". This is the Effects Screening Level (ESL) description. Emissions of crude oil occur at the VLCC's Vent Mast Riser when loading crude into the ship. Stack parameters and emission rates used for this analysis are given in Table 11-1 below. As a conservative measure, the maximum hourly rate was used for both the 1-hour and annual ESL averaging periods.

Table 11-1: Stack Parameters for Health Effects Analysis

Source ID	Source Description	Latitude Decimal Degrees	Longitude Decimal Degrees	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)	VOC Emissions (g/s)
STACK	VLCC Vent Mast Riser	28.541554	94.996868	0	20	298	10.80	0.91	593.40

Modeled concentrations of crude oil were compared to the appropriate ESL for the 1-hour and annual averaging periods. TCEQ published guidelines for Effects Evaluations for Marine Vessels, *"Effects Evaluation Procedure: Marine Vessels, TNRCC Memo, August 2001"* which gives guidance on impacts over water. Specifically, the guidance states that "the max concentration should be less than 25 times the ESL and should not exceed 10 times the ESL more than 24 hours per year. Not more than 10 of those hours should have concentrations which exceed 20 times the ESL."

The results of the State Health Effects Review modeling are shown in Table 11-2. Although there are exceedances of the ESL, they occur at industrial receptors over water. Modeled crude oil concentrations do not exceed 10 times the ESL. Therefore, the modeled magnitudes of impacts and frequency of exceedance are considered acceptable.

Table 11-2: Results of Health Effects Analysis

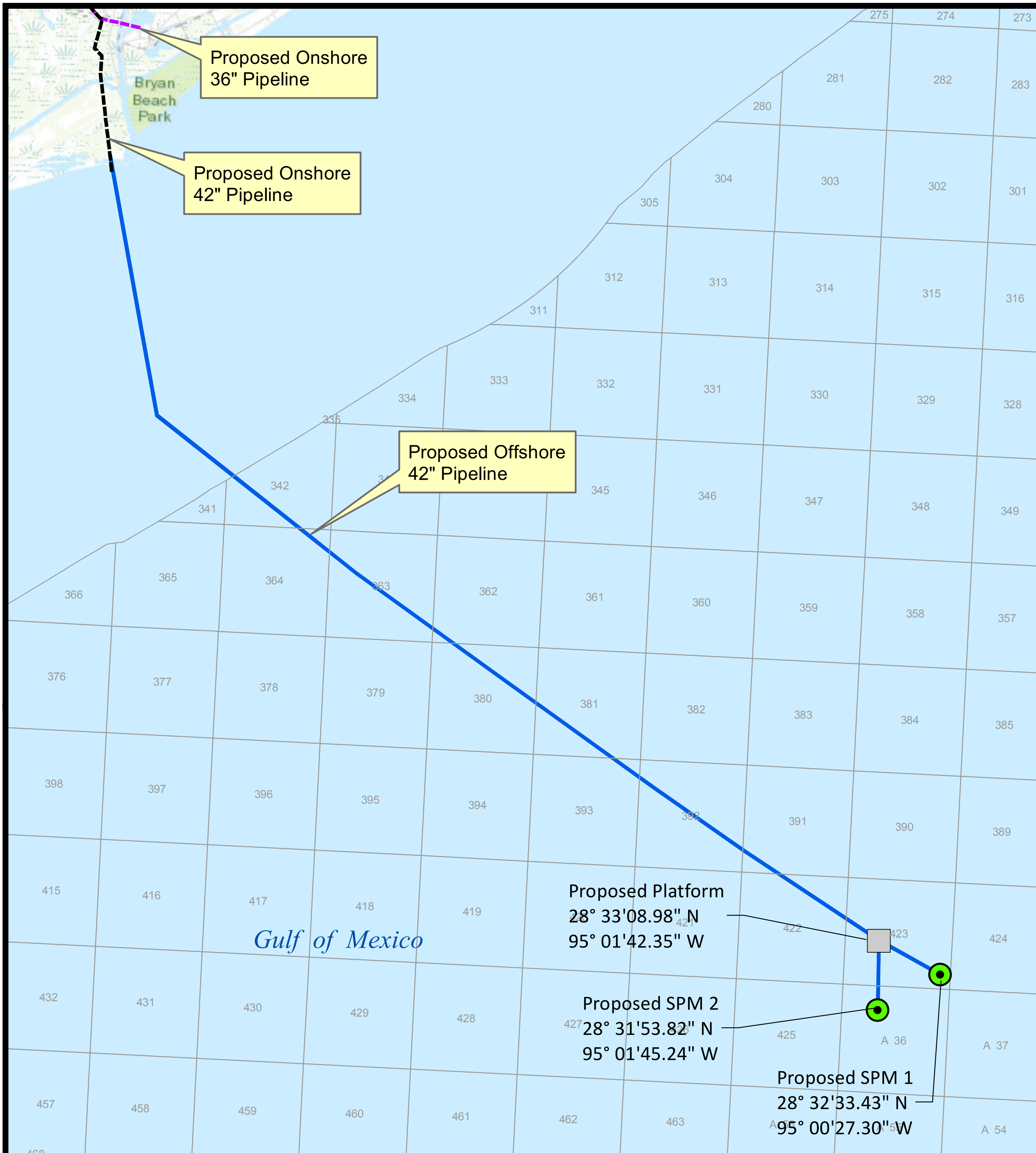
Pollutant	Meteorological Year	Averaging Period	Modeled Concentration[1] (ug/m^3)	ESL Standard (ug/m^3)	Multiple of ESL	10X ESL Exceedance?	20X ESL Exceedance?
Crude Oil Vapor (<1% Benzene)	2004	1-hour	15,799	3,500	4.5	No	No
	2004	Annual	444	350	1.3	No	No

[1]The receptors in the model are industrial receptors over water.

FIGURES

Figure 1

Offshore Site Location Map



Sentinel Midstream
Dallas, Texas

Texas GulfLink

Offshore Location Map

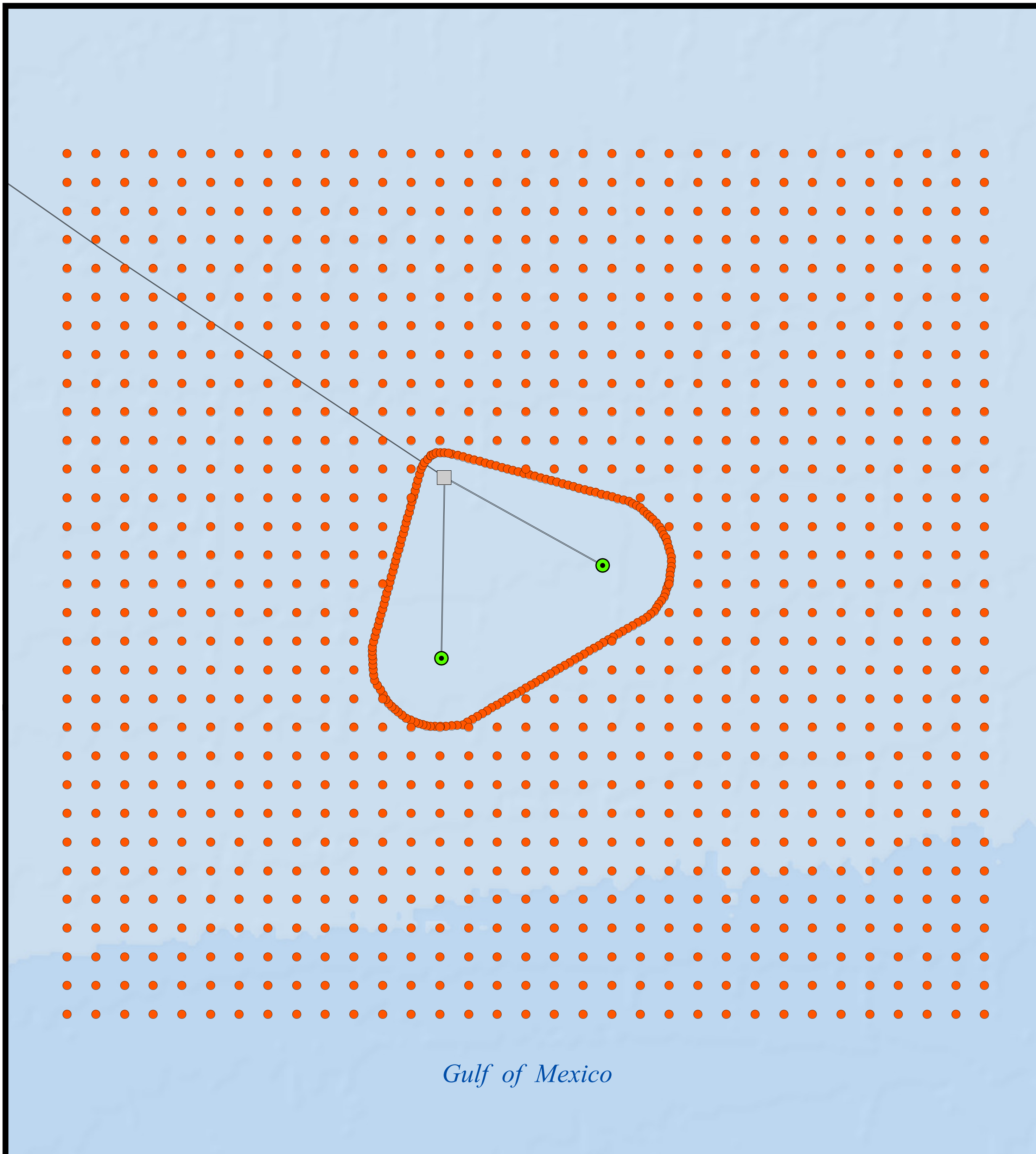
N

0 3
Miles

Drawn:	CPL	Checked:	BLN
Date:	05/03/19	Approved:	TEW
Dwg. No.:	A17073-36	**Figure 1**	

Figure 2

Receptor Locations



- Receptor
- Proposed Platform
- Proposed SPM

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Dallas, Texas

Texas GulfLink

Receptor Grid

N

0 1
Miles

Drawn:	CAL	Checked:	MEH
Date:	12/11/2019	Approved:	JLS
Dwg. No.:	A17073-113	**Figure 2**	

Appendix A

Electronic Modeling Files

OCD modeling input and output files are provided electronically and can be downloaded using the One Drive link below. Access is password protected.

https://cka-my.sharepoint.com/:f:/g/personal/james_smith_c-ka_com/ErALVThiKNpMnsr49cAASjIBzqJD8wRBf3sfwdxT1rbBGQ?e=72qpta

Appendix B

VISCREEN Printout

```
              Visual Effects Screening Analysis for
                Source: TGL DWP
                Class II Area: San Bernard Natl Wildlife


                ***   Level-1 Screening   ***
Input Emissions for

   Particulates    31.32  TON/YR
   NOx (as NO2)   961.74  TON/YR
   Primary NO2      0.00  TON/YR
   Soot             0.00  TON/YR
   Primary SO4      0.00  TON/YR


    **** Default Particle Characteristics Assumed

              Transport Scenario Specifications:

    Background Ozone:                  0.04 ppm
    Background Visual Range:          20.00 km
    Source-Observer Distance:         68.00 km
    Min. Source-Class I Distance:     60.00 km
    Max. Source-Class I Distance:     75.00 km
    Plume-Source-Observer Angle:      11.25 degrees
    Stability:   6
    Wind Speed:   1.00 m/s

                         R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

         Maximum Visual Impacts INSIDE  Class I Area
          Screening Criteria ARE NOT Exceeded
                                    Delta E      Contrast
                                  ===========   ============
Backgrnd Theta Azi Distance Alpha Crit  Plume   Crit  Plume
======== ===== === ======== ===== ====  =====   ====  =====
 SKY      10.  75.   65.8    94.  2.00  0.118   0.05 -0.001
 SKY     140.  75.   65.8    94.  2.00  0.036   0.05 -0.001
 TERRAIN  10.  60.   62.2   109.  2.00  0.006   0.05  0.000
 TERRAIN 140.  60.   62.2   109.  2.00  0.002   0.05  0.000


         Maximum Visual Impacts OUTSIDE Class II Area
          Screening Criteria ARE NOT Exceeded
                                    Delta E      Contrast
                                  ===========   ============
Backgrnd Theta Azi Distance Alpha Crit  Plume   Crit  Plume
```

```
======== ===== === ======== ===== ====  =====    ====  =====
 SKY      10.  50.   59.4   119.  2.00  0.091   0.05 -0.001
 SKY     140.  50.   59.4   119.  2.00  0.028   0.05 -0.001
 TERRAIN  10.  50.   59.4   119.  2.00  0.006   0.05  0.000
 TERRAIN 140.  50.   59.4   119.  2.00  0.002   0.05  0.000
```

SENTINEL MIDSTREAM

TEXAS GulfLink

The signature below confirms that I have knowledge of the facts included in this application and that these facts are true and correct to the best of my knowledge and belief.

I am authorized to sign as an agent of Texas GulfLink and Sentinel Midstream for the proposed Texas GulfLink Deepwater Port.

I further state that I understand my signature indicates that this application meets all applicable nonattainment, prevention of significant deterioration, or major source hazardous air pollutant permitting requirements.

x

Tyler M. Abadie, P.E.
Texas Gulflink
Deepwater Port Licensing Lead

STATE OF TEXAS
TYLER M. ABADIE
132953
LICENSED
PROFESSIONAL ENGINEER

1-7-2020

Sworn and subscribed to me, the undersigned Notary Public, this 7th day of January, 2020, in the Parish of Jefferson.

Tod J. Everage

My commission expires at death.

TOD JOSEPH EVERAGE
NOTARY PUBLIC No. 89443
State of Louisiana
My Commission is for Life